RADBOUD UNIVERSITEIT NIJMEGEN

TRIPLE HELIX IN LIMBURG

THE ECONOMY AND REGIONAL GOVERNMENT IN TRANSITION

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PREFACE

My time as a student is coming to an end with this thesis. After five years it is time to say goodbye to the academic world and start a new chapter in life.

I would like to use this opportunity to thank the various people who have made it possible for me to finish this thesis, my supervisor prof. dr. F. Boekema for his time, patience and comments. It took quite some time to settle on a topic but he provided me with the advice and comments needed to settle on a topic and produce this theses. I would also like to thank Marc de Leeuw for his time and comments which have helped a lot. Furthermore, the employees of the department of economics and innovation from the government of Limburg and the Chemelot B.V. who provided me an internship and level of cooperation that made me feel blessed.

All there is left to say is to wish you a pleasant time reading my master thesis.

Jorn Joosten

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ABSTRACT

The economy of Limburg is changing. The predominantly industry based economy is transitioning towards a knowledge based economy. In order to preserve employment and to gain a competitive edge through this transition, the government of Limburg released the so called Versnellingsagenda's. These Versnellingsagenda's did not only define the economic transition but also the institutional transition that the government of Limburg had to make in order to cope with the changing demands of the economy. The Chemelot campus was a project to help the regional economy transition towards a knowledge based economy. This study is an exploratory study to understand the role of the regional government in the development of the Chemelot campus in more detail. The main research question can be formulated as following:

What is the role of the government of Limburg in stimulating the knowledge economy on the Chemelot campus and to what extent has the founding of the Consortium Chemelot B.V. led to a transformation of this role?

Creative destruction as defined by J. Schumpeter is the theoretical base of this study. Creative destruction is:

> The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets,... (This process incessantly revolutionizes the economic mixture within, incessantly destroying the old one, incessantly creating a new one (Schumpeter, 1942 in Aghion & Howitt, 1990, p. 2).

This process of Creative Destruction is the essential fact of capitalism.

As the regional economy is undergoing creative destruction, so too is the related institutional framework. For the government of Limburg this meant a transition towards the triple helix model. The triple helix model proposes that the interaction between university-industry-government is the key to improve innovation in a knowledge economy. The triple helix model denotes a transformation in the roles and relations each institution has. The traditional division of institutions by function is no longer valid as institutional boundaries are blurred.

The case study is used as the research design with in-depth interviews, observation, participation and literature review as data collection tools. The case study is a linear but iterative methodological design. Case studies are preferably used with explanatory studies as the case study deals with operational links that need to be traced over time. The data collected by using the literature review, in-depth interviews, observation and participation was analyzed and led to the following claims.

The government of Limburg had a leading role in the so called campus development in the time period 2004-2008. It was representative M. Eurlings who saw the potential of the campus development and laid the foundation for a new set of beliefs that started the transition of the regional government. This led to the Versnellingsagenda which described the new economic strategy; together with DSM they were responsible for the first investments in the Chemelot campus.

The second Versnellingsagenda was a continuation of the first except for the fact that the concept of campus development was explicitly mentioned. All thought the concept of campus development was a good indicator that the awareness and focus of important actors on the campus increased; there were some hurdles that slowed the campus development down during this period.

The foundation of the triple helix was still fragile and representative J. Kessels and J. Ritzen from the University of Maastricht had trouble with the campus developments. Because they did not share the beliefs as their predecessors and fellow actors, they slowed down the triple helix formation and their commitment towards the campus.

In the period 2010-2012 the first four projects were designed and executed under the triple helix governance: the real estate of the Chemelot campus, the participation of a new venture fund (Limburg Ventures II), the development of a Science program and the establishment of advanced shared services on the Chemelot site (Enabling Technologies). However it was the regional government that invested and subsidized a disproportional large part.

With the founding of the Chemelot B.V. in 2012, the role of the government of Limburg changed drastically. The Chemelot B.V. stood for a change in government participation, from subsidizing and facilitating towards investing and participating. The government of Limburg became a shareholder of the Chemelot B.V. together with UM and DSM, each 33.3%.

Secondly, the legal commitment provided a stable institutional framework. It allows the private sector to have a stable reference over a minimum of ten years, especially in systems that contain or require large capital investments, both physical and human, is this an important requirement. The triple helix transition cannot get off the ground if institutions swap out whenever they feel like it, organizations must be prepared to make heavy commitments and must be tightly bound to their commitment through formal agreements. Otherwise defection is too tempting and the uncertainty of innovative processes will prevail.

However the asymmetrical power relations between the three shareholders prohibited the triple helix from fully functioning and slowed down the governmental transition towards investor. The constant struggle to keep DSM connected to the region and the unwillingness of the UM to adapt to a new role within the campus development has forced the government of Limburg to make several risky investments. The regional government is under pressure from the regional population to create jobs. DSM and the UM would sometimes use this pressure as a tool to force the government of Limburg into funding certain projects it would not have funded otherwise. Hence DSM and the UM can reject the triple helix partially by using the “market failure” argument, without specifying to force the government of Limburg into funding projects.

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1. INTRODUCTION

The economy of Limburg is changing. DSM, one of the largest and important firms in Limburg, especially in the south, launched in 2002 a new strategy. The new strategy was designed to transform the petrochemical dominated business portfolio into a multi-speciality firm, by selling the petrochemical division of the firm and focusing on knowledge intensive high-tech materials (DSM, 2004b, p. 6). In 2002 DSM implemented another reorganization strategy named Copernicus to boost the efficiency and effectiveness of the company. This projected job loss was 500 fte plus without the projected job loss that resulted of the potential outsourcing of several administrative divisions (DSM, 2004a). This course change was a reaction on the emergence of the knowledge economy. The knowledge economy uses scientific knowledge as a production factor and DSM needed to change accordingly.

The government of Limburg knew that this transition was inevitable and in order to secure the competitive character of the regional economy, government guidance and intervention was needed in order to protect its interest and to help DSM and other firms make the transition as smooth as possible. The government saw this transition as an opportunity to get a competitive edge. Under pressure of the labor unions in 2004, a covenant was signed between DSM, the municipal of Sittard-Geleen, the province of Limburg and the labor unions, aimed to further develop the research park at the Chemelot site into an open innovation campus (Chemelot campus B.V., 2013b.). DSM framed it as a new step forward in opening up their facilities to new knowledge intensive companies; techno starters to help built a stronger regional economy (DSM & LIOF, 2003; Forum voor Techniek en Wetenschap, 2003). In October of 2005 the Versnellingsagenda was released. This was the first step by the government in a series of new policy programs and measures to support the economy in this transition.

The Versnellingsagenda also meant a change for the government in order to stay relevant and to be able to accommodate the new challenges that the economic transition brought with it (Taskforce Versnellingsagenda, 2005). The economic strategy was built on three economic pillars: a distinctive grid of coherent “clusters van kracht”, innovative Small and Medium Businesses [SMB or MKB in Dutch] and a well-developed knowledge infrastructure (Raad van advies versnellingsagenda, 2008, p. 4. The Chemical and high tech material cluster is one of the key growth potentials for the development of the regional knowledge economy as a whole (Taskforce Versnellingsagenda, 2005, p. 11-12.

The triple helix was named as the model that the government would adopt in developing the new Chemelot campus. Triple helix referred to a new industry-government-knowledge institutions institutional framework that would create the most stimulating environment for the knowledge economy to thrive. This meant that the government and other institutions had to reformulate its role in stimulating the development of the Chemelot campus (Etzkowitz, 2003).

1.1 RESEARCH GOAL

Representative Martin Eurlings was outspoken and in favor of the campus development. He was one of the driving forces behind the Versnellingsagenda 2005 and forced the government of Limburg to redefine its economy policy (F. Schaap, personal communication, 4 April 2014). The focus shifted towards the strengths that the regional economy possessed. Back up by the Dutch national policy that identified the Chemelot campus as one of six campuses of national interest (Wagemans &

Przybylski, 2011, p. 25). The government of Limburg started to change its view towards the economy and which role it could play.

However organizations often have trouble when making a transition to a new role or model. The government is no exception. Although a lot has changed since 2005, there is still much to be done. In order to better understand how this transition has manifested itself a closer look is needed at the role of government in the development of the new Chemelot campus. The research goal can be dictated as following:

To gain insight (1) to what degree the founding of the Consortium Chemelot B.V. led to a transformation in the role of the government of Limburg in stimulating the knowledge economy on the Chemelot campus by analyzing (2) the role of the government of Limburg in stimulating the knowledge economy on the Chemelot campus.

From that research goal the following research question can be distilled:

What is the role of the government of Limburg in stimulating the knowledge economy on the Chemelot campus and to what extent has the founding of the Consortium Chemelot B.V. led to a transformation of this role?

1.2 Relevance

A desire drives science and scientific research. This desire can have different natures, a desire can be of scientific nature where there is a lack of knowledge or multiple scientific assumptions or theories compete with one and another to explain phenomena. But there can also be a societal need for scientific research. The expression of phenomena can bring uncertainty with it or a desire to deal, guide and/or control them. This research is no different; innovation processes are complex and the need for understanding them is required in order to design supporting government policies. The current paragraph will further elaborate on the relevance of this research.

1.2.1 Societal relevance

When reading about the claims made about the relevance one must not forget that this research is limited in both time and theoretical and empirical depth. At the regional level, the economy of Limburg has a few negative developments. The development of the gross regional product [GRP] is negative with a decrease of 0.8% ("CBS: Limburgse economie," 2013). The labor market also shows some negative development. The labor force has declined with 0.2% in the period 2008-2012 (table 1) and the labor force consists of a large portion of low education workers. In 2011 25.1% of the labor force in Limburg was low educated; this is higher than the Dutch average of 23.9% (Bais et al., 2012, p. 149-150). Limburg has the second lowest portion of HBO and WO workers in the Netherlands (Bais et al., 2012, p. 9). Future developments are also not positive, ING estimates that the economy of South-Limburg will develop negatively by -1.1% in 2013 (Bais et al., 2012, p. 7).

The campus development should counteract this development. Already the Chemelot campus has an important economic value. The Chemelot campus offers work to over 5500 people and should provide an additional 1000 fte for knowledge workers and 8-10 additional jobs per knowledge job created (Wagemans & Przybylski, 2011). In order to support this development the province of Limburg has committed itself both financially and policy wise. The government of

Limburg invested millions in real estate, starting capital for the consortium Chemelot campus, research facilities and projects that help the campus to grow. Jut in the first few months of 2014 the government has approved €91 million in funding for projects on the Chemelot campus (Chemelot B.V., 2013; (Provincie Limburg, 2014b; (Provincie Limburg, 2014c). The "kennis-as" program, led by the University of Maastricht and Zuyd Hogeschool, with financial backup from the local government and other parties, is worth €580 million in investments (Maastricht UMC+, Maastricht University & Zuyd Hogeschool, 2013, p. 8).

Table 1: Status of the labor market of Limburg

	Limburg (x1000)		Development (%)
Time Frame	2008	2012	2008-2012
Unemployed labor force	23	28	+21,7
Employed labor force	485	480	-0.01
Total labor force	509	508	-0.002

(CBS, 2013)

In order to reach this goal, well-designed policies are needed. However the government of Limburg is struggling in defining this new role within this grander scheme. An example is the definition of the role of the government in the Consortium Chemelot Campus masterplan 2010-2020: investing and/or subsidizing in case of market failure. The government has for years been subsidizing and subsidizing is what the government does best. While the government wants to move away from subsidizing in the development of the Chemelot campus, it is struggling due to lack in knowledge and experience in the use of different financial instruments (Daniels, 2014). This lack of knowledge can in turn prevent policy makers to fully comprehend the value of new developments (Carlsson & Jacobsson, 1997, p. 302).

Wagemans & Przybylski (2011, p. 29) and M. Hinoul (2011) mention that the lack of structured cooperation within the triple helix model is a negative point. Structured cooperation is essential; interaction between different institutions presumes communications between different value systems, including a potential conflict (Leydesdorff & Etzkowitz, 1998, p. 198). Cooperation structure can reduce and even prevent interaction failures. Both too much and too little interaction can hinder innovation (Woolthuis, Lankhuizen & Gilsing, 2005, p. 613). Too much interaction or strong network failures occur when actors are guided by wrong information. The different perceptions of different network actors may blur their visions and guide them in the wrong direction, as they are unable to fully comprehend the value of the new introduced novelty (Carlsson & Jacobsson, 1997, p. 302). Weak ties occur when institutions lack the underling connection to share their base of knowledge and fruitful cycles of learning and innovation are hindered (Woolthuis et al., 2005, p. 614). Although this is not surprising, the consortium Chemelot campus is a new setting for all three parties, therefore a learning curve is expected (F. van Lissum, personal communication, 14 January 2014).

If viewed on a larger scale, a third necessity can be named. The EU, compared to the US has problems in reaching firms with university spillovers and university based start-up companies. Several reasons underlie to this problem. One is that universities have little stimulus to commercialize their innovation (Johansson, Karlsson & Backman, 2007, p. 8), US educational developments have led to more entanglement of academic and industry collaboration as public

funding account for a lower percentile of total revenues of US compared to EU universities (Rynes, Bartunek & Daft, 2001, p. 341). Moreover, regulation within Eu-15[1] is more time- and cost consuming than in the US. The average number of procedures to start a firm within EU-15 is nine compared to four for the US. Furthermore, the average time to start a new firm within EU-15 is nine times longer and on average three times more expensive than in the US (Johansson, et al., 2007, p. 21). Their still much room left for understanding and improving multi institutional innovation frameworks (Hartmann, Pyka & Hanusch, 2008, p. 2).

1.2.2 Scientific Relevance

Firstly this research can help to further develop neo-Schumpeterian economics. Neo-Schumpeterian economics needs further development in order to become a comprehensive approach like neoclassical economics. The co-evolutionary process of the industry -, finance - and public pillar need further development (Hanusch & Pyka, 2005, p. 19).While there has been made great contributions on government policies regarding innovation there is still much room for improvement. Hartmann, et al. (2008, p. 6) argue that in order to create a comprehensive theory of neo-Schumpeterian development, much more additional theoretical and empirical work is needed. The firm has been the central point of investigation so far in most neo-Schumpeterian studies, but other aspects must be included in order to delve deeper into the innovation process. The role of the government within the innovation process will be central in this research. Synthesis between different studies with different focal point is needed to create a comprehensive framework that covers all areas of innovation (Windrum & Garcia-Goni, 2008, p. 650-651).

Innovation processes as a whole are not fully understood yet. This has to do with the broad nature of innovation processes. Innovation is a collection of different phenomena amongst different institutions (Fisher, 2001, p. 201). At the heart of a successful introduction of innovation lies the co-evolution of different institutions (Hanusck & Pyka, 2005). Literature on the learning region has made great contributions on tacit knowledge and how networks between different institutions play a key role, but it has also provided us with enough failed attempts to ground the argument why some regions can adapt and make the next step and other regions cannot in empirical enquiry (MacKinnon, Cumbers & Chapman, 2002, p. 303).

The neoclassical school has been dominant in the last past decades and has become a widespread theoretical model to explain and understand innovation and more importantly how different institutions should behave. A recent surge in non-neoclassical traditions to understand and explain innovation has highlighted the limitations of neoclassical economics as theoretical model to explain economic development and innovation. In order to fill this void, many scientific contributions were made in an effort to better explain innovation. Hayek's view of competition is one where competition is a virtuous mechanism of selection. Competitors do not need to make a search to the knowledge they require as the economic system will provide them with the signals they need to guide their search (Wohlwuth, 1999, p. 4).

Neo-Schumpeterian research could contribute to this discussion. Neo-Schumpeterian and evolutionary economics open up the complex multi-agent environment. Social, economic and political institutions combined with path-dependency and socio-economic trajectories should provide a more complete framework (Windrum & Garcia-Goni, 2008, p. 649). Neo-Schumpeterian research is

[1] Not including Luxembourg

concerned with overcoming barriers and the new role of the government within a multi-actor framework (Hanusch & Pyka, 2005).

The majority of government behavior is according neoclassical assumptions and market failure. Innovation policies designed accordingly are well intended and are well embedded in a theoretical framework, their success rate is far from optimal and in certain cases is the decisive bottleneck hampering all sustainable development (Hartmann, et al., 2008, p. 2). Recent advances in neo-Schumpeterian and evolutionary economics has shown the limitations of neoclassical designed innovation policies. Market failure designed policies are criticized for being too rigid and undermine the dynamic process of innovation (Metcalfe, 2003, p. 10). The static picture of the economy as a base for innovation policy design is unsuitable to cope with uncertainty, knowledge asymmetries and variation (Sovacool, 2010, p. 925) among sectors and space. These insights can give rise to a new policy instruments framework. The evolutionary policy framework is concerned with change, selection, knowledge asymmetries and path dependencies. Although current insights render the neoclassical policy framework inappropriate, an equal comprehensive evolutionary policy framework is still lacking (Nill & Kemp, 2009, p. 669).

1.3 Structure of the thesis

The second chapter will elaborate on the emergence of the knowledge economy. The transition of the manufacturing economy towards a knowledge economy has influence on the economic organizing principles. This transition is part of a phenomenon that is known as creative destruction. The innovation driven economy is in constant motion and the concept of creative destruction is further elaborated. Creative destruction is not limited to firms; the government is also undergoing a transition. This is the central point of this thesis, what are the implications of creative destruction and how does the government of Limburg deal with it.

The third chapter will provide the research methodology. The choice for the case study as research design will be grounded in both theoretical and practical arguments as well as the collected data sources will be elaborated on. The different data collection tools each have advantages and disadvantages and being aware of these advantages and disadvantages is important to doing scientific research. An overview of the interviewed respondents is enclosed. Finally a critical reflection on the data collection process is given to highlight the limitations of the research.

The fourth chapter is the analysis of the data. The chapter begins by giving a small history lesson regarding the Chemelot site and its importance towards the regional economy. The analysis can crudely be divided into two parts. The period before 2010 and after 2010; the period 2004-2010 was the beginning of the development of the Chemelot campus and the beginning of the development of the institutional framework. 2010 and onwards saw the institutional framework being formalized and saw the transition of government of Limburg take shape.

The final chapter will provide the reader with the conclusion of this research. The practical and theoretical limitations are important to keep in mind when reading the conclusion.

2. THEORETICAL FRAMEWORK

This chapter provides a detailed overview of creative destruction as defined by Josef Schumpeter (Hanusch & Pyka, p. 3), which serves as base for the analysis of the role of the government and how this has changed with the founding of the Chemelot B.V.. The chapter is divided in three parts: the first part elaborates on the transition of a manufacturing economy towards a knowledge based economy and what new economic organizing principles emerge. The second part is a theoretical description of the driving force behind that transition: creative destruction. The final part introduces the concept of triple helix. In order to meet the new demands of the changing economy the traditional government is undergoing an organizational creative destruction were the old neoclassical based government transitions towards a triple helix model.

2.1 TRANSITION TOWARDS THE KNOWLEDGE ECONOMY

The importance of knowledge in economic growth has always been great but over the past few decades that importance has grown. Not only has the recognition that knowledge is important grown, countries are increasingly investing in the creation, production and spreading of knowledge (Organization for Economic Co-operation and Development [OECD], 1996, p. 9). Between 1995 and 2005 the export of knowledge intensive services such as: financial services, computer services, business services and royalties and license fees grew over 100% compared to a 50%growth of traditional services (Brinkley, 2006, p. 11). The rise of information and communication technologies such as the computer and the internet provided the platform for knowledge to be exchanged. It reduced the costs of handling, storing and moving of knowledge (Lundvall & Johnson, 1994, p. 25). Knowledge is not depleted by use; instead knowledge gains its value to an economy by sharing it with others (Brinkley, 2006, p. 5).

Knowledge over the years has become increasingly important (OECD, 1996, p. 9). The role of knowledge in economic development has become greater over the last decades. A shift is beginning to occur, learning and the production of knowledge is becoming a more fundamental and strategic process. Knowledge is regarded as a full-fledged production factor. Investments in knowledge are made and knowledge is becoming more infused with product processes and services (Lundvall & Johnson, 1994, p. 26).

The widespread adoption of knowledge as a production factor has not only led to a change in existing economic sectors but has also led to a variety of new services and jobs. The common denominator in all these changes is that they are knowledge intensive. Knowledge intensive is defined as an economic process in which a greater emphasis is placed on knowledge compared to natural resources, physical capital and labor (Brinkley, 2006, p. 3).

Economic processes formed a basis for new processes of interactive learning but in recent times these learning processes have become institutionalized (Lundvall & Johnson, 1994, p. 26). Feedback loops for knowledge accumulation have been built in economic processes to benefit producers and consumers of knowledge. The organizational setup of firms is increasingly devoted to enhance learning and production of knowledge (Brinkley, 2006, p. 4). Horizontal and vertical movement along production chains, within and outside economic sectors and related institutions is becoming increasingly important (Lundvall & Johnson, 1994, p. 26).

The institutionalization of learning processes has led to a changing and dynamic economic set-up. Collaboration and networking between firms, knowledge based institutions, research facilities are becoming the order of the day (Brinkley, 2006, p.4). In order to promote this collaboration and

networking the physical layout of the economy is changing (Lundvall & Johnson, 1994, p. 26). Cluster- and campus development become a dominant organizing principle. The campus is a regional system usually in a defined area where different institutions compete and collaborate. Each institution is in pursuit of knowledge and the commercialization of new knowledge in respect of products, processes and organization (Cooke, 2001, p. 953). Numerous researchers have highlighted the organizational limitations of established firms to generate knowledge internally (Dushnitsky & Lenox, 2005, p. 617; (Brinkley, 2006,). New forms of interfirm agreement have rising the last few years, alongside the traditional patenting as the method of gaining and creating knowledge (Fisher, 2001, p. 202-203). These interfirm agreements are more flexible and better equipped to deal with change as they are more easily changed or dissolved than internal developments or mergers. Knowledge creation is an interdependent process between different kinds of institutions. Interaction between individuals is necessary for knowledge creation (Lundvall & Johnson, 1994, p. 26).

Networks per se are not beneficial to innovation, the increased opportunities to generate knowledge are. As individuals, through their formal roles in organizations, are a crucial part of knowledge creation and generation. These individuals have different roles in different situation and networks. Employees bring the knowledge they gathered from these roles back to their organization (Cenatiemp & Casey, 2010, p. 2). Institutions need both tacit and codified information to create knowledge. Tacit information is rooted in the social dimension and is more difficult to articulate because it often arises out of experience and is less easily transferred while codified information, such as standard protocols, is the information that can be written down and relatively easily transferred from one person to the next (Adler, 1996, p. 2). However, the assumption that codified information is omnipresent thanks to improvements in communication technologies and emergent markets of intellectual property rights is wrong. Substantial costs are associated with identifying, assessing, assimilating and applying codified information. Even in situations where codified information is readily available, the infusion with tacit information is required, only when tacit and codified information are combined will knowledge be generated (Adler, 1996, p. 3; Bathelt, Malmberg & Maskell, 2004, p. 32).

Interaction between firms, knowledge institutions, research facilities and other related institutions can happen in different networks and through various means of communication. The nature of communication between institutions and firms can be formal and informal, structured and unstructured, local and (inter)national (Bathelt, Malmberg & Maskell, 2004, p. 42). Proximity is important as interaction can happen quickly and actors are usually more familiar with each other's capabilities. Actors outside the campus are important. Although the assessment of the value of an outside institution costs time and effort, they still can have their value. The strength of weak ties cannot be underestimated (Harrison, 1992 in Bathelt et al., 2004, p. 42). By linking different actors from different social or economic domains new and useful information can become available (Grabher, 2006, p. 14).

However, knowledge is not a public good nor does everyone has access to the same knowledge (OECD, 1996, p. 14). Small and new firms often lack the established knowledge networks of larger established firms. Established firms in their turn are often slower to respond especially if they hold a large market share, use their absorptive capacity as well their standardized knowledge diffusion networks to gain new knowledge more efficiently (Ehrenfeld, 2012, p 5; Archibugi & Michie, 1998, p. 33-34).

The costs of building the lines of communication for new and smaller firms are often relatively large; by collaborating with established firms they can bypass these costs (Fallah & Ibrahim,

2004, p. 11). Collaboration can indeed reduce costs and enlarge the network that one can build on his own. But asymmetrical power relations between actors are part of innovation. Knowledge asymmetries are part of the innovate process and thus should not be counteracted, instead the entry costs to networks should be reduced (Brinkley, 2006, p. 5). Flexibility, multiple knowledge exchange points and fortified connections between knowledge institutions and businesses must be created. Investments should be made in knowledge transport infrastructure and/ or encouragement of knowledge handlers to have a higher rate of spatial mobility (Johansson, Karlsson & Backman, 2007, p. 11).

The difference in nature of institutions can be enriching to the process of knowledge creation yet at the same time can be a hindrance in communication between institutions (Rynes, et al., 2001, p. 339-340). Bridge building between different institutions is important (Brinkley, 2006, p. 5). A more competitive economy has made firms more receptive to new ideas, academic and knowledge institutions have become more dependent on private funding and research facilitation. Assuming that jargon, language and meanings are uniform is wrong, governments, academics and businessmen belong to two different communities and have different beliefs and assumptions regarding knowledge and therefore do not always speak the same language (Rynes, et al., 2001, p. 339-340). This can have the effect that organizations where knowledge creation is highly regarded but mentoring and assisting others not, are reluctant to share their knowledge as it may diminish personal gain or is perceived to be too time consuming (Leonhard & Sensiper 1998 in Seidler-de Alwis et al., 2004). An open dialogue is required to come to compromises as minimal levels of trust are required (Dawes, Cresswell & Pardo, 2009, p. 394). Innovation requires blurring of institution boundaries (Gibbonds et al., 1994 in Leydesdorff & Etzkowitz 1998, p. 196). Cockburn & Henderson comment: *"the ability to 'do good science' in the private sector may not be supportable in the long run without a close partnership with the institutions of open science. Policies which weaken these institutions, make public sector researchers more market oriented, or redistribute rents through efforts to increase the appropriability of public research through restrictions in the ways in which public and private sectors work with each other may be, therefore, counterproductive in the long run* (1998 in Montobbio, 2009, p.190)."

As time goes by and communication between institutions develops, not only the substance of the communications develops, but also their codes. By translating codes and beliefs a new jargon emerges. Institutional differences that were used to differentiate institutions are now used to identify each other. Strategic communication can open new windows; combining different perspectives can ensure the survival of firms. New niches are discovered which are superior to others. The emerging mix of opportunities is continuously assessed, and agreements and disagreements about the best guesses can then be codified and communicated (Leydesdorff & Etzkowitz, 1998).

2.2 Creative destruction

The introduction of novelties that invoke a transition from a manufacturing economy towards a knowledge based economy because the old economic structures are no longer economic profitable is defined as creative destruction (Aghion & Howitt, 1990, p. 1). The introduction of computers and internet was an innovation, an innovation that provided a platform for the creation, production and diffusion of knowledge that led to the rise of new knowledge based products and services. The rise of information and computer technologies reduced costs and made it easier and faster to share, handle

and store knowledge. The reduced costs of storage of knowledge that came along with the rise of information and computer technologies induced a change in the economy by inducing pre-existing production processes with knowledge as a viable production factor and production, leading new economic sectors to rise, and existing ones to change (Lundvall & Johnson, 1994, p. 26).

Unlike the traditional equilibrium-oriented approaches following the classical mechanics of prices as their central concept, the neo-Schumpeterian market (Hanusch & Pyka, 2007, p.2) is not in a state of equilibrium between demand and supply. Traditional equilibrium-oriented approaches place price mechanisms as the central driving force of economic development; thus contradicting with the neo-Schumpeterian conception which places innovation at the core of economic development. Prices are means for limiting conditions and creating equilibrium; innovation will overcome limitations and create change (Hanusch & Pyka, 2005, p. 2). Innovation has been described as a force of change. The definition of innovation is as different among academics as there are forms innovation can have (Garcia & Calantone, 2002, p. 110). Innovation within neo-Schumpeterian economics is seen as a broad concept which encompasses more than just new products. Innovation can be defined in the words of Schumpeter (1934, p. 66 in Sundbo, 1998, p. 20) as:

I. Introduction of a new product or a new product quality

II. Introduction of a new production method. This need not to be a new scientific invention. It might consist of a new way of treating a product commercially

III. The opening up of a new market

IV. The opening up of a new source for raw materials or semi manufactures regardless of whether the source has existed before

V. The creation of a new organizational structure in industry, for example by creating or breaking down a monopoly situation

Novelties introduced into a set system of economic activity lead to change. A novelty requires the combined co-evolution of the public sector, financial sector and industry in order to accommodate to newly introduced innovation. Novelties are a qualitative change; as it brings structural changes forth by forcing the industry-financial sector and public sector to evolve in order to cope with the newly introduced innovation (Hanusch & Pyka, 2005, p.8). The new opportunities that arise from innovation induced change and the obsolete rendering of old products, services, processes and structures that cannot cope with the new opportunities is known as creative destruction (Aghion & Howitt, 1990, p. 1).

One important nuance must be made regarding the scale of creative destruction that is discussed above. Every innovation produces change however not every innovation will produce creative destruction on the scale discussed in the previous paragraph. This is the difference between radical innovation and incremental innovation. This distinction is made based on the impact the introduced novelty has on qualitative changing the economy. Radical innovation is a major change that represents a shift towards a new technological paradigm. A large portion of earlier investments render obsolete, these investments are technical skills and knowledge, designs, production techniques, plants and equipment. This creates a high degree of uncertainty within an organization and industry (Pedersen & Dalum, 2004 in Popadiuk & Choo, 2006, p. 305). Radical innovation causes

discontinuations on multiple scales. Change that occurs on a world, national or industry scale will automatically result in change on firm and consumer scale. This type of innovation does not always addresses a recognized demand from consumers; sometimes it creates a previous unknown demand (Garcia & Calantone, 2002, p. 120-122).

The OECD's Oslo Manual (2004 in Popadiuk & Choo, 2006, p. 305) categorizes incremental innovation as insignificant, minor, or do not involve a sufficient degree of novelty. The majority of innovations done are incremental. Incremental means that they provide new features, improvements or enhance existing products, production processes, organizations or market. Although they are insignificant and minor in their power to change existing technological paradigm they are important to firms for two reasons: (1) they are a competitive weapon in a mature market and (2) they can alert and prepare businesses to deal with upcoming radical innovations (Garcia & Calantone, 2002, p. 123). Table 2 details the differences between incremental and radical innovations in 9 different perspectives. The rate at which these innovations happen differentiates. Incremental innovations are introduced at a steady pace; radical innovations are rare and happen at 50-54 year intervals. Radical innovations are often viewed in relation to Kondratieff cycles (Perez in Hanusch & Pyka 2007, p. 778-779).

Following Schumpeter's argument, the introduction and development of innovation can be divided into three phases. Although this is a simplification of real world conditions it nevertheless is a useful analytical model. The first phase is the novelty generation: this is the first introduction of innovative potentials. The actualization of an idea to an actual economic opportunity is happening at this phase. After that the selective adoption phase begins. Innovation has been introduced; imitations of the original idea take place. It is a very unstable and chaotic phase. Everybody wants to participate in the winning and new economic potential, interplay between path-dependency and competition in adoption process. Trough imitations the diffusion of the initial innovation becomes widespread. More investments are needed in capital, knowledge and workers. A multiplier effect starts to shape and the qualitative change affects all levels of the economy (Hanusch & Pyka, 2005, p. 3). Structural changes of the economy take place as new industrial sectors become dominant and others decline (Sledzik, 2013, p. 9). The final phase is retention. In this phase the initial innovation is widespread and repetitive behavior sets in. The socio-economic environment is moving towards stagnation equilibrium. Innovators try to break this shift towards an equilibrium by coming up with new ideas, this behavior will lead to a reintroduction of the first phase (Dopfer in Magnusson, 1994, p. 139).

Innovation, big or small is the product of entrepreneurial spirit. Entrepreneurs saw new economic opportunities in the use of computers and internet, hence providing the incentives for the transformation towards a knowledge economy. Entrepreneurs saw new ways to secure profit, however profit gains are not unlimited hence the constant introduction of innovation (Metcalfe in Pyka, Cantner, Greiner & Kuhn, 2009, p. 57). Less entrepreneurial business minds imitate the novelty introduced by the original entrepreneur and increase the supply of the new commodity of service. The increased supply will deplete the profit margin until elimination and transform the environment for future novelties. The second risk consists of other entrepreneurs who take different routes to entrepreneurial profit, novelties competing with each other for the same market. Entrepreneurial profit is thus not income like wages or rent (Schumpeter, 1934, p. 93 in Hanusch & Pyka, 2007, p. 22), entrepreneurial profit cannot be understood ex ante, it is the value that is associated with the change of development that novelty produces (Metcalfe in Pyka et al., 2009, p. 57-58).

The entrepreneur does not only act within a set of given opportunities (Sundbo, 1998, p. 130). This is the traditional Homo economicus. The neoclassical homo economicus only reacts to opportunities and is depicted as a static agent. The neo-Schumpeterian entrepreneur is a resourceful person who actively searches for new economic opportunities. The entrepreneur is dissatisfied in situations which come close to a neoclassical equilibrium (Hanusch & Pyka, 2007, p. 22).

Relating back to the transition from manufacturing economy towards a knowledge based economy, the knowledge intensive sectors were the winners as they rapidly amassed profit and older less competitive sectors could not. Through imitations the diffusion of the initial novelty becomes widespread. More investments are needed in capital, knowledge and workers. A multiplier effect starts to take shape and the qualitative change affects all levels of the economy (Hanusch & Pyka, 2005, p. 3; Sledzik, 2013, p. 9).

> The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets,... (This process incessantly revolutionizes the economic mixture within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism (Schumpeter, 1942 in Aghion & Howitt, 1990, p. 2).

Economic opportunities are not unlimited, in contradiction to innovative potentials. An idea becomes an innovative potential if it can be realized in time and space. Economic opportunities are the actualizations of such innovative potentials. This has several implications for the entrepreneur. Innovative potentials are not exhaustible, as ideas are never consumed; only their actualization is limited. The capacity of the entrepreneur for actualizing innovative potentials is dependent on limitations; further elaboration takes place in the next paragraph, set by the current social-economic system and the innovative capacity of an entrepreneur. The innovative capacity of an entrepreneur is defined by common processes and previously acquired knowledge and competencies, supported by the appropriate organizational structures, strategy, climate, culture and leaders, can collectively contribute to an environment that enables and/or is favorable for innovation (Metcalfe in Hanusch & Pyka, 2007, p. 945). An entrepreneur that faces an environment with a limited amount of economic opportunities cannot generate profit from searching for more economic opportunities but must search for more innovative potentials (Dopfer in Magnusson, 1994, p. 137-138).

The multi institutional framework defines the success and rate at which innovation is introduced. The ability of the institutional framework to foster new innovations is based on the potential to harness and create new knowledge. The world is viewed through the knowledge that is present. Innovations are conceived trough a mixture of existing knowledge and technology, the realization of an idea happens on historical knowledge and possibilities the inventor has accumulated over time and space. Historical knowledge and technology does not only limit future innovation but guide future innovation both in problem definition of the to-be-solved problem and technical solutions (Kaiserfeld, 2005, p. 10). The ability to foster innovations is not static, changes over time and space occurs. Knowledge feedback loops change the social-economic environment (Dosi, 1982, p. 151). The interactions between innovation and the socio-economic environment make for a co-evolution of both. Historical formed barriers are overcome by new gained knowledge and technology. Different points in space and time change human preference and pose a different set of opportunities and problems (Nelson & Winter, 1982, p. 368).

Innovation causes economic structures to change and as a result demands new institutional structures, the rise of institutionalized learning processes and new economic structures required a changing and more dynamic government (Lundvall & Johnson, 1994, p. 26). However the government like any other large institution cannot change easily. The current institutional paradigm wants to stay the same. The current structures and knowledge are formed historically; historically developed knowledge and beliefs limit the possibility for today's problem solving or development of ideas. But it is a dynamic environment that changes through time and space. Innovations feedback loops change the social-economic environment (Dosi, 1982, p. 151-153). The interactions between innovation and the socio-economic environment make for a co-evolution of both. In order for the government and other institutions to change, several hurdles must be taken.

The first hurdle that must be overcome in order to change is uncertainty. Change equals uncertainty and nobody likes uncertainty. The government which has to design policies will be confronted with uncertainty and cannot predict accurately the effects and efficiently of policies. This makes change rather uncomfortable as the government wants to be sure about their policy choices (Metcalfe in Hanusch & Pyka, 2007, p. 945).

The second hurdle that must be overcome is that a new belief and knowledge must be available before innovation can happen. The government has a large civil service apparatus each with different beliefs. Older civil servants may hold different beliefs regarding existing organizational structures, policy wise and political views. Politicians have different beliefs and struggle with dividing the interests of their voters and doing what needs to be done (R. Joosten, personal communication, 27 February 2014). In order to combine these beliefs and knowledge into a common vision proves time consuming (Metcalfe in Hanusch & Pyka, 2007, p. 945).

2.3 TOWARDS TRIPLE HELIX

The transition from a manufacturing economy towards knowledge economy influences each institution that is connected with the economy (Leydesdorff & Etzkowitz, 1998, p. 196). Such an institution is the government, which is intertwined with the economy. Governments are in a transition away from the neoclassical tradition that dominated their economic policies for decades. Central to the idea of market failure is that markets are unable to correctly price information and have a tendency to produce socially inefficient and undesirable outcomes, which provides the rational for market failure correcting policies (Metcalfe, 1994, p. 932).

The idea of a perfectly competitive allocation of resources misreads the nature of present competition and innovation processes. The uncertainty associated with innovative investments make it impossible to correctly price present ideas and investments. Innovation depends on the creation of private, asymmetric knowledge that justifies the original investment (Johansson, Karlsson & Backman, 2007, p. 11). Therefore are innovation processes structured by non-market methods, heavily depending on knowledge networks and trust. In this sense it is difficult to define market failure; as a broader institutional framework defines how markets work. These arrangements are not compatible with the neoclassical static market of isolated firms; as the neoclassical competition implicitly defines that market mechanism have an advantage over other mechanism (Hauknes & Nordgren, 1999, p. 5-6).

The concept of entrepreneurship has no meaning within an economic equilibrium. The entrepreneur introduces uncertainty which disrupts established patterns and drives the innovative process. The nature of innovative processes prevents the emergence of fully complementary future

markets. Only in a stationary economy could this be solved via rational calculation. Profits follow from the commercialization of ideas that some have and some do not have. Reducing knowledge asymmetries or market failures reduces the incentives to invest in future innovative ideas (Metcalfe in Hanusch & Pyka, 2007, p. 949-951).

As described can the neoclassical doctrine, which flourished in government policies, not incorporate the concept of an innovation driven economy (Metcalfe, 1994, p. 932). As the economy is in transition it requires a new set of economic policies. The infrastructure of the knowledge economy implies an endless transition. Interactions and communications are constantly changing and in motion, particularly as knowledge is used as a production resource, this constant reconstruction is creative destruction (Etzkowitz & Leydesdorff, 2000, p. 113).

The transition from a more neoclassical government towards a triple helix model is organizational creative destruction (Schumpeter, 1934, p. 66 in Sundbo 1998, p. 20). In the neoclassical government the emphasis is on facilitation and creating basic conditions for the market to flourish. The government is not active participating in the steering and stimulating of economic developments. The government is a static organization with clear institutional boundaries. Hence the government is somewhat closed off from the outside world, with long decision making processes that are not transparent (Metcalfe, 1994, p. 932).

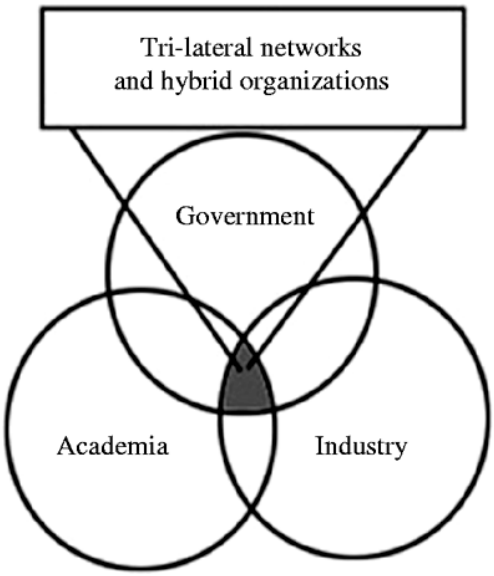
The triple helix model proposes that the interaction between knowledge institutions-industry-government is the key to improving innovation in a knowledge economy (Leydesdorff & Etzkowitz, 1998, p. 197). The triple helix model denotes a transformation in the roles and relations each institution has. The traditional division of institutions by function is no longer valid as institutional boundaries are blurred, see figure 1 (Etzkowitz, 2003, p. 295). This means that the government has to reorganize its structure to deal with new forms of collaboration, networking and resource allocation. Traditional decision processes have to change as decision making processes happen under the influence of government-industry-knowledge institutions.

Instead of three separate decision making processes, resource allocations and interests, the three institutional spheres come together and form a new mode of institutional organization (Etzkowitz, 1998). Governments start designing policy in collaboration with knowledge institutions and firms and reorganize work structures to accommodate collaboration and communication with knowledge institutions and firms (Nill & Kemp, 2009, p. 668). The innovative activities of a firm involve a wider range of institutions that help supply the knowledge, skills and regulation necessary to underpin the activities of an individual firm (Metcalfe, 1994, p. 932).

The role of the government becomes much more fluid and dynamic in according with the needs of knowledge institutions and firms. This can lead to new hybrid organizations or organizational structures that encompass all three spheres (Etzkowitz, 2003, p. 295). This fluidity should lead to a government that provides the ecology that facilitates experimentation and creating the broader institutional framework. This broader framework consists of many different institutions, each with their own place.

Although institutions take on different roles, they can never replace one and another (Etzkowitz, 2003, p. 295; Leydesdorff & Etzkowitz, 1998). Even the most entrepreneurial university can never replace a firm. The core of each institution represents a different set of rules and value systems, different cultures and incentives (Rynes, et al., 2001, p. 339-340). The success rate depends on the degree of co-evolution and stability of the different institutions (Hanusck & Pyka, 2005). Policy must therefore be concerned with connectivity, bridging different institutions and interface barriers between institutions in both formal and informal connectivity.

Figure 1: Triple helix model



(Etzkowitz & Leydesdorff, 2000, p. 111)

Policy must address much more than R&D in private firms and policy makers must address complex questions of institutions and their connectivity (Metcalfe, 1994, p. 933). The current emphasis on collaborative research programs, campus and cluster development, incubators, pilot firms, funding of R&D are important examples of bridging mechanisms (Rynes, et al., 2001, p. 339-340). Each of these is a device, whether conscious or not, to deal with a systemic failure in the innovation process, a failure in the self-organization of connection and interaction. In this mindset there is no place for the promotion of individual innovate activities, rather providing the framework in which the innovation system can better self-organize across the range of economic activities. All organizations in a system must be consciously outward oriented (Walker, 2002, p. 845-846).

The rules that shape each organization are effective barriers of communication, a natural cause of different incentives goals and focus on internal procedures. Policy here tends to address the problem of missing connections or missing bridges in the innovation system (Etzkowitz, 2003, p. 299).
The institutional framework should provide a high degree of stability. It allows the private sector to have a stable reference over a longer time period (Siebert in Hanusch & Pyka, 2007, p. 971), especially in systems that contain or require large capital investments, both physical and human. Policies cannot get off the ground if institution swap out whenever they feel like it, organizations must be prepared to make heavy commitments and must be tightly bound to their commitments trough formal agreements. Otherwise defection is too tempting and the uncertainty of innovative processes will prevail (Walker, 2002, p. 845-846).

The snag is that institutional commitment, an important factor to the success rate of innovative processes, can intentionally or unintentionally contain the seeds of entrapment in inferior options. The costs of entrapment in inferior options can be significant and cannot be expressed alone in economic terms (Metcalfe in Hanusch & Pyka, 2007, p. 960-961). The challenge in policy design is to include warning systems of undesirable entrapment; ensure that alternatives develop and that switching costs are not held high unnaturally. Unfortunately, extrication can be perceived as unwanted or difficult. Naturally there is a tendency to postpone extrication until better times come. Politically it is often a very sensitive subject and postponement is more preferably than living with mistakes until change is absolutely a necessity. There is an ever-present danger of preserving arrangements designed and instituted for yesterday's problems, not the problems of the future (Walker, 2000).

Bridge building between institutions can seem easily however it is often difficult due to various reasons (Rynes, et al., 2001, p. 339-340). Policymakers do not differ from other individuals in the sense that they too have to operate with limited knowledge. Besides not having complete access to information, the policymaker is limited by constraints set by a higher political authority. Policymakers must often design policy for multiple goals, complementary and contradicting and

cannot been seen separately from the political context in which they were designed. Policymakers have not perfect understanding of market behavior, knowledge creation processes and technological opportunities, so policies may fail the moment they are designed. Policies should therefore able to learn and adapt (Metcalfe, 1994, p. 933). Policies should be predictable, flexible, simple and effective. Policy should focus on the policy goal not the technical solutions through which it is achieved; leaving space for innovative solutions and non-linearity's (Commission of the European communities, 2006, p. 6).

Public intervention should never be a "one size fits all", successful strategies may and can be used as an example or inspiration but should never be copied nor should "picking the winner" policies be implemented (Boschma, 2009, p. 25). The fact that innovative systems are not static, just as innovative processes it means that they are constantly evolving. Policy can therefore only facilitate not design. Design is emergent as emergent properties arise that may lead to nonlinearities, uneven, catching-up -, leapfrogging - as well as forging-ahead – dynamics (Archibugi & Michie, 1998, p. 33-34). Innovation is non-linear, characterized by feedback loops (Sovacool, 2010, p. 925-926) that spur uneven development over time and space.

Innovation is experimentation; the room to experiment should be incorporated in the design (Archibugi & Michie, 1998, p. 33-34). The optimal design cannot be chosen ex ante. Deductive decision making processes should be replaced with inductive experimental ones; the search for rationality can in these circumstances lead to the wrong decisions (Sugden, 1991 & Arthur, 1992 in Melcalfe, 1994). Only by trial and error will change occur and policy should not shun the failing entrepreneur (Wonglimpiyarat, 2006, p. 1086). In short, policy should not concern itself with the optimizing an objective function instead the focal point should be to stimulate the introduction and diffusion of innovation.

3. Methodological framework

Data collection must be done according certain scientific criteria. In order to understand the chosen data and the limitations of the used dataset, this chapter will provide the necessary explanation. The chosen research design is the case study, although this research design is fluid and lacks a certain hardness it is not without scientific criteria. In order to preserve the scientific integrity and standards, the chosen research design and data collection tools will be described. The advantages and disadvantages of the data collection tools, in-depth interviews, observation, participation and literature study will be listed in order to understand the claims made by the author. At the end of this chapter the limitations and remarks regarding the data collection process will be listed in order to provide a clear overview of the value of this research.

3.1 Case study design

The case study is a linear but iterative methodological design. Case studies are preferably used with how and why questions. These questions are more explanatory and lead to the use of the case study as it deals with operational links that need to be traced over time (Yin, 2009, p. 9), events outside the control of the researcher and focuses on contemporary phenomena within the real world context (Yin, 2009, p. 2). Iterative means that the researcher throughout the process switches between theory, evidence and method. This is a cyclic and time-consuming process.

The advantage is that it provides detailed descriptions of not only the studied phenomenon but also the real-life environment. The complexity of contextual relation is captured within these descriptions that would otherwise be lost or not captured in surveys or pure quantitative research (Zainal, 2007, p.4). The case study is a type of field research; field studies study phenomena without intervention of the researcher. The case study design contains a high degree of flexibility, without any predisposed structures for observation and analysis. The studied phenomenon will guide the researcher. This saves the researcher from making the wrong assumptions beforehand. Flexibility allows the researchers to make adjustments to his research if unexpected findings occur (Fidel, 1983, p. 274). This flexibility is not only limited to unexpected events. The data sources that can be used are flexible. Both qualitative and quantitative data sources can be used to better understand the phenomenon. Quantitative data can be used to support qualitative data to reveal patterns of underpinned behavior. Case studies are not per se qualitative research. Case studies can be entirely based on quantitative data (Yin, 1984, p. 25). The researcher must be careful when making general claims based on case study research. The size and number of cases studied have a direct effect on the scope of proposition the researcher can make (Gerring, 2004, p. 347).

3.2 Conduct and evaluation criteria

Validity and reliability are two factors that concern every researcher while designing, executing and judging the quality of the performed study. Critique on qualitative research often focuses on the lack of reproducibility. The research is biased and often a collection of anecdotal evidence that is strongly subject to the researcher's bias. Hence the issue those different researchers would not reach the same conclusion (Mays & Pope, 1995, p. 109). This correlates to the question proposed by Lincoln & Guba: "How can an inquirer persuade his or her audiences that the research findings of an inquiry are worth paying attention to?" (1985, p. 290). To answer to the question, Healy and Perry (2000 in Golafshani, 2003) assert that criteria to evaluate the quality of a study in each paradigm should be

judged by its own paradigm's terms. Within the positivist paradigm, the criteria of validity, generalization and reliability are well known and well used.

3.2.1 QUALITATIVE EVALUATION CRITERIA

Qualitative research rejects the positivist notion (Healy and Perry, 2000 in Golafshani, 2003). Reality can be personal and diverse. Instead of one reality in which all finding must respond, qualitative research respects the world and all of its diversity and it addresses personal realities during research. Research is subjective by definition, both the researches as the researched can be subjective. The quality of quantitative research is much like qualitative research dependent of the skills of the researcher. Statistical data can be easily manipulated and may not provide the complete picture (Mays & Pope, 1995, p. 109). In order to pair this critique many contributions and propositions are made towards a universal of qualitative criteria: Lincoln & Guba (1985), Hammersley (1992), Henwood & Pidgeon (1992) and Bochner (2001) (Finlay, 2006) have all contributed to the debate to establish qualitative evaluation criteria. Lincoln & Guba have especially been influential with their naturalistic approach. Lincoln & Guba (1985) proposed the concept of trustworthy, research should be trustworthy. The concept contains four elements: credibility, transferability, dependability and confirmability.

Credibility: (internal validity) is concerned with how congruent are the findings with reality? Credibility replaces the positivist notion of truth value (Seale, 1999, p. 468) and is one of the most important factors in establishing trustworthiness (Shenton, 2004, p. 64). If applied to our case it questioned whether the representation of the government of Limburg is accurate with the actual role of the government in the innovation process on the Chemelot campus. Member checks are the most important tool to increase the credibility of a study. Member checks are checks relating to the accuracy of the data (Shenton, 2004, p. 64). Member checks will be built in this research by letting interviewees read the transcripts of the interviews and data used from policy documents will be checked by public servants of the government of Limburg.

Transferability: (external validity) concerns only case-to-case transfer. There is no single correct interpretation; therefore the traditional generalization is out of the question as subjective meaning is central to the naturalistic approach (Tobin & Begley, 2004, p. 392). Researches should provide enough information to readers for them to judge whether the findings are applicable in other cases. Providing thick descriptions, a term made popular by Clifford Geertz, is a manner to provide the readers with emotions, thoughts and perceptions of that research participant's experience (Ponterotto, 2006, 541). In order to achieve the maximum transferability I will provide my readers with thoughts and assumptions that lay behind the current policy of the government of Limburg combined with descriptions of the contextual influence will provide an optimal level of case specific information.

Dependability: research should be logical, traceable and well documented (Shenton, 2004, p. 71). Data, methods and the end product should be if possible examined by other. Self-criticism is an important second part of dependability (Shenton, 2004, p. 71). During this research process, frequent draft versions on the different chapters and the final product will be handed in to a supervisor. In the final product a self-critical exam of the overall research product will be included. During the meetings with the supervisor an open dialogue is present; during this dialogue a critical exam of the research process up to that point will take place.

Confirmability: (objectivity) are the presented findings derived from the actual data or are they biased by the researchers conscious or unconscious feelings or imagination (Tobin & Begley, 2004, p. 392). To the extent possible, future findings will be grounded in different data sources and a reliable databank of the raw data will be made public.

3.3 Case selection

Before a case study can be done, a case has to be chosen. A case selection can be done regarding a number of criteria. The case may be selected because of an intrinsic interest from the researcher. The researcher wants to understand the case and has no intention of generalizing the results. If the results are generalized this occurs via naturalistic generalization. The second reason is statistical sampling. In hypothesis-testing research, the cases are chosen from a larger population. The goal is to find accurate variables across the population (Johansson, 2003, p. 8). Thirdly a case can also be selected for theoretical or analytical reasons. The case is chosen for its information-richness, critical, relevancy, unique or extreme- in contradiction to the representational cases within correlation strategy. These cases are usually not chosen via a randomly sampling method and the select method is preferable. The amount of cases that can be investigated within the time period are limited. Thus choosing cases that are extreme or polar types are preferred (Eisenhardt, 1989, 537).

The government of Limburg is the unit of analysis. A unit is a spatial bounded phenomenon observed over a single point in time or a delimited period of time (Baxter & Jack, 2008). The government of Limburg is perfect as the boundaries of the organization are relatively easy to asses. Besides the perfect fit as a unit, the government of Limburg is chosen because of its information richness and theoretical reasons. An important issue in innovation studies and neoschumpeterian economics is bringing the policy maker back into the innovative process. The firm has been the main research point for many studies and the government, who is just as important in the multi-actor framework, needs research in order to better understand the relationship and influence between knowledge intensive innovation and the government (Windrum & Garcia-Goni, 2008, p. 649-650). The role of the government in the development of the Chemelot campus will be used as an example for future participation in the Maastricht health campus. Understanding the dynamics of campus development, innovation and the government in the Chemelot campus can prevent the government of Limburg from making mistakes or better understand the process when participation in the development of the Maastricht heath campus happens.

3.4 Data selection

Yin And Stake identify six data sources that can be used in a case study: documents, archival records, interviews, direct observation, participant observation and physical artifacts. The required information is often divided in different over multiple data sources. Using different data sources can therefore provide a larger information source and it can act as a check against false data sources. Besides that, each data source has its advantages and disadvantages and this makes some data source more useful than other in certain situations. Data sources must be seen as complementary and used in that fashion. However the number of data sources must be restricted to only include those that are relevant. The more is not per se better (Tellis, 1997). Four different data sources will be used in this research (Figure 3).

3.5 RESEARCH METHODOLOGY

Literature review: "a systematic search of published work to find out what is already known about the intended research topic (Robinson & Reed, 1998, p. 58 in Da Silva Rodrigues, 2009, p. 100). The literature review served many purposes, to establish the need for this research and preventing from copying another research. Bless (2010 in Da Silva Rodrigues, 2009, p. 10) gives more specific reasons literature review can be used:

- To sharpen and deepen the theoretical framework of the research.
- To familiarize the researcher with the latest developments in the area of research.
- To identify gaps in knowledge, as well as weaknesses in previous studies.
- To identify variables that must be considered in the research.
- To study the advantages and disadvantages of the research methods, in order to adopt them in one's own research.

The main goal is to gain as much knowledge as possible or needed on the problem to gain as much understanding and insight as possible (Cronin, Ryan & Coughlan, 2008, p. 38).

The literature review for this research focused on creative destruction for the theoretical framework. Scientific publications were reviewed to form an understanding over the concept of creative destruction and the triple helix.

The methodological framework was build using literature review as basis. Scientific publications over case studies and qualitative research methods were used. This was necessary to understand the value and limitations of the chosen research design, case selection and data collection methods.

Finally, literature review was used to understand and gain insight in the research problem. Policy documents, internal memo's archival records provided by the government of Limburg, DSM and the Chemelot campus organizations. These documents were also used to determine the scope of this research and identify the necessary respondents.

Interviews: these were another important part in collecting the data needed to answer the research question. These in-depth interviews were held to better understand certain policy decisions and considerations that led to these decisions, not every consideration was documented. They could provide a level of detail that was missing from written material (Boyce & Neale, 2006, p. 3).

An interview guide was made beforehand to provide structure to the interview and to provide neutrality. Interviews can be prone to bias due to subjective questions or a researcher's desire to prove his hypothesis (Boyce & Neale, 2006, p. 3). An open mind is required during the interview as pre-interview judgment or bias can act as a barrier to communicate or listen appropriately (Guion, Diehl & Mcdonald, 2011, p. 2).

The interview guide was adjusted to each respondent and served as a tool, the interview guide was not absolute and deviation from it was allowed depending on a respondent's answer (Boyce & Neale, 2011, p. 3). Human interaction can be complex and the flexibility in cope with this is important in conducting an interview (Guion, et al., 2011, p. 2).

8 in-depth interviews were executed. A list of the respondents can be found in appendix VI. The respondents were chosen for their knowledge and relations with the research topic. Due to research constraints such as inability to speak with several potential respondents and time

constraints a feasible number of respondents were chosen. 8 respondents were enough as the information from the interviews was the same as in previous interviews (Boyce & Neale, 2006, p. 7).

Observation and participation: due to the nature of this research, the researcher had the opportunity to participate with his study subject. This had led a situation where the research is geared towards conducting the research process with the people who are the subject of the study (Bergold & Thomas, 2012). The strength of this method is to explore local knowledge and perceptions (Cornwall & Jewkes, 1995, p. 1668).

In practice this means that the researcher had the ability to attend meetings and participate at the workplace, providing insights and information that is not written down. The most important findings will be documented, checked and questioned in the interviews or written documentation if possible; however time constraints prohibit the checking and questioning of each piece of information.

In order to ensure that they were willing to share their thoughts with the researcher a safe haven was build (Bergold & Thomas, 2012). If necessary a subject could withdraw any provided information or deem it classified. This helped to build trust and helped to engage with the subjects.

Table 2: types of data sources

Source of Evidence	Strengths	Weaknesses
Documentation	• stable - repeated review • unobtrusive - exist prior to case study • exact - names etc. • broad coverage - extended time span	• retrievability – difficult • biased selectivity • reporting bias - reflects author bias • access - may be blocked
Archival Records	• Same as above • precise and quantitative	• Same as above • privacy might inhibit access
Interviews	• targeted - focuses on case study topic • insightful - provides perceived causal inferences	• bias due to poor questions • response bias • incomplete recollection • reflexivity - interviewee expresses what interviewer wants to hear
Direct Observation	• reality - covers events in real time • contextual - covers event context	• time-consuming • selectivity - might miss facts • reflexivity - observer's presence might cause change • cost - observers need time

(Tellis, 1997)

4. CHEMELOT CAMPUS

The fourth chapter presents the analysis of the collected data. The collected data consist of the in-depth interviews, literature review and observational notes. The analysis answers how the theoretical concept of creative destruction (Aghion & Howitt, 1990, p. 1) unfolded itself in practice. The chapter presents he role of the government of Limburg and the transition it is undergoing. The chapter is divided into several paragraphs. Each paragraph analyses the role and transition of the government over a time period, beginning in 2002 and ending in 2014. The first paragraph entails the time period 2002-2005, which holds the beginning of the transition process. The second paragraph provides the time period 2005-2010 and in this time period the emergence of the two Versnellingsagenda's occurs. The third time period analyzed in the period 2010-2010 which are the early days of the founding of the Chemelot B.V.. The final paragraph is 2012-2014, in this period the Chemelot B.V. is operational and the triple helix is formalized. For this division is chosen because each period holds a unique piece of the transition.

4.1 THE SIGNING OF THE COVENANT

DSM made a strategic decision in early 2000 to reorganize its business activities (Frost & Sullivan market insight, 2002). This reorganization consisted of two strategies. The first strategy was "vision 2005" (Frost & Sullivan market insight, 2002). The strategy was designed to focus DSM core business on multi-speciality and less on petrochemical activities (van Dalen, 2004). This resulted in the sale of the petrochemical division to SABIC in 2002 (DSM, 2004b, p. 6). Because of the sale two major players were located on the same site. Hence the name change: Chemelot campus (Chemelot campus, 2013b).

In 2002 DSM implemented another reorganization strategy named Copernicus, designed to boost the efficiency and effectiveness of the company. This projected job loss was 500 FTE and the potential outsourcing of several supporting firm divisions (DSM, 2004a).

DSM implemented these two strategies to focus more on knowledge intensive activities (Frost & Sullivan market insight, 2002) and better cope with the changing economic climate in which knowledge based services become increasingly important (OECD, 1996, p. 9).

The reorganization of DSM shook the government of Limburg and made it realize that the regional predominantly industry based economy was changing towards a more knowledge based economy (Provincie Limburg, 2008). In order to keep DSM in the region and help the regional economy transition towards a knowledge based economy, the regional government, under pressure of the labor unions in 2004, signed a covenant DSM, Sittard-Geleen, province of Limburg and the unions, aimed to further develop the research park at the Chemelot site into an open innovation campus (Chemelot campus, 2013b) and connect DSM to the region (Kooij, 2013, p. 3).

The covenant that was signed did not include a long term commitment from DSM as market developments were too unpredictable (Provincie Limburg, 2004b). However on the short term the government of Limburg was successful in connecting DSM to the region. For the period 2004-2007 DSM would invest €40 million in the region:

- € 5 million for the development of an organization for acquisition and imago branding of the Chemelot campus
- € 27 million. For the development and revitalizing of the Research & Development campus, €10 million will become available after an evaluation in 2006
- € 8 million from Limburg Ventures (already existing)

The contribution from various governments should come out as following:

National government	€ 4 mln	Chemelot is on the list as majeure project, €4 million is unsecure
BNI	€ 5 mln	No commitment ministry of Economic affairs
Gov. of Limburg	€ 3 mln	Futher down elaborated
LIOF	€ 5 mln	Limburg venture fonds
EFRO	€ 1 mln	No commiment so far
S-G	€ 2 mln	Positive reactions, no commitment
	€ 20 mln	

Government of Limburg funding:
Period till 2007

Knelpuntenfonds	€ 400.000,00
Centre for new business (business plan)	€ 30.000,00
Additional innovation projects	€ 1.000.000,00
Labor market/ education	€ 600.000,00
Revitalising	€ 1.000.000,00
	€ 3.030.000,00

Additional:
Maurits terminal € 1.500.000,00

Total **€ 4.530.000,00**
(Provincie limburg, 2004b)

DSM framed the development of the Chemelot campus as a new step forward in opening up their facilities to new knowledge intensive companies (technostarters) to help built a stronger regional economy and help to actualize the open innovation concept (DSM & LIOF, 2003; Forum voor Techniek en Wetenschap, 2003). In actuality it was a strategy to find new tenants for the vacant real estate at the site, which was a financial burden for DSM. Essentially, until 2005 this real estate initiative was part of the private strategy of DSM, besides the regulatory involvement of local government and of labor unions (Kooij, 2013).

4.2 The two Versnellingsagenda's

Representative Eurlings was under political pressure to start realizing progress as the coalition agreement of 2003 was rather hollow (van Elmpt, 2011, p. 126-128). Representative Eurlings took the DSM opportunity to alleviate some political pressure, connect DSM to the region and preserve and create employment (Taskforce Versnellingsagenda, 2005, p. 33). M. Eurlings saw the opportunities that the transition towards a knowledge economy offered and led the development of the Versnellingsagenda 2005 (Taskforce Versnellingsagenda, 2005, p. 9; F. van Lissum, personal communication, 14 January, 2014).

The Versnellingsagenda identified three clusters of strength: health, chemical and agro-food. These three clusters were chosen for their regional importance and economic performance (Taskforce Versnellingsagenda, 2005, p. 6). The Chemical cluster was chosen because of its focus on

R&D and knowledge production (Taskforce Versnellingsagenda, 2005, p.33-34). The commission ZONederland consisting of the ministry of economic affairs and the governments of Brabant and Limburg was commissioned with the challenge to develop the economic program "Pieken in de Delta" into concrete regional projects (Provincie Limburg, 2005c).

Within the clusters of strength, the Versnellingsagenda appointed the Chemelot campus as an acceleration project that would be accelerate the strategic move by DSM to focus more on knowledge based specialties and connect DSM to the region (Kooij, 2013, p. 3-4; Taskforce Versnellingsagenda, 2005, p. 7). The goal was to create a powerful, open campus that functioned as a hub in a large knowledge network that encompassed students, knowledge workers, firms and knowledge institutions domestic and abroad (Taskforce Versnellingsagenda, 2005).

The Versnellingsagenda described besides the economic transition of the regional economy, the transition that the regional government had to make in order to fulfill the demands of an economy in transition (Taskforce Versnellingsagenda, 2005, p. 32). That transition meant for the government of Limburg transition towards the triple helix model. The triple helix would provide new dynamics and new learning processes between industry-government-knowledge institutions (Taskforce Versnellingsagenda, 2005, p.32). The Versnellingsagenda 2005-2008 was initially enthusiastic received but those tasked with the implementation of the Versnellingsagenda had to overcome several hurdles to successfully execute the proposed projects (van Elmpt, 2011, p. 126-128). This is only natural as any transition has to overcome hurdles (Metcalfe in Hanusch & Pyka, 2007, p. 945). One of these hurdles was uncertainty; it was unclear who should be in charge of the execution, the government of Limburg, LIOF or option number 3? Eventually it was decided that a new program agency, led by H. Hoogervorst would be in charge. It turned out to be a good decision (van Elmpt, 2011, p. 126-128).

During the first few years DSM and the government of Limburg were struggling with the triple helix model (F. van Lissum, personal communication, 14 January 2014) which could be expected. Industry-government-knowledge institutions boundaries were strict and they were not used to working together in a triple helix. This strict separation is historically formed and DSM, the government of Limburg and the UM needed time to change as new knowledge and beliefs are necessary in order to overcome these structures (Dosi, 1982, p. 151-153). The government of Limburg described itself as the leading party, the collaboration in 2004-2005 between the different actors difficult and was hoping to give the other actors more responsibility but that was a difficult topic which needed further exploration (Provincie Limburg, 2004a).

The campus development until 2008 was driven by the government of Limburg and DSM for the most part during the first few years and even the DSM-government collaboration was not optimal. How good or how bad communication between the two was, is up for discussion. F. Schaap argued that communication was good and that there were regular meetings between DSM and the government of Limburg to discuss projects and progress. However the majority of respondents from the government of Limburg argued that communication was incidental (F. van Lissum personal communication, 14 January 2014; H. Daniels, personal communication, 8 January 2014; Provincie Limburg, 2005a). The most likely explanation is a difference in viewpoint. Compared to the situation before 2004, it was a vast improvement; compared to the current situation it was indeed very occasional.

Another indicator that the government was starting to make a transition was the policy choice that the government made. The government started making choices by shifting towards a

technology policy as the core of their economic policy. Secondly the regional economic policy was shaped by working together with industry and knowledge institutions (van Elmpt, 2011, p. 129).

Overall the campus development was met with skepticism (F. Schaap, personal communication, 4 April 2014). This skepticism came from a lack of shared belief system (Metcalfe in Hanusch & Pyka, 2007, p. 945). Not everybody within the government and DSM were convinced in the succeeding of the Chemelot Campus. This was expressed in several ways. DSM did not regard the Chemelot campus as core business and would not until 2010. The business acquisition targets: 150 fte over a three years period and 8 new firms were low, especially in comparison which current targets (Provincie Limburg, 2005c) F. Schaap who was in charge with the acquisition expressed that it was vital for the future of the Chemelot campus to reach the targets. If these numbers were not met, the plug would be pulled out of the campus development.

DSM presented a new strategy in 2006: Vision 2010. This strategy was designed to sell the remainder of bulk activities and become an even more specialized firm (DSM, 2010, p. 30-37). Before the sale, the supporting business divisions: DSM Manufacturing Center [DMC] were transferred into a new legal entity: Sitech Services, founded in 2009. DSM, OCI Nitrogen and LANXESS are the current shareholders and are at the same time the owners of the remaining factories at the Chemelot Industrial park that DSM had left after the sale of the petrochemical division to SABIC. Sitech Services provides supporting services to the Chemelot campus such as: maintenance, security general infrastructure. The main reason was to preserve the expertise and knowledge within one organization (Chemelot B.V., 2013b).

The vision 2010 strategy and the resulting outcomes led to an important change in the government involvement in the Chemelot campus (Chemelot B.V., 2013b). The government of Limburg decided to create a new overarching environmental permit for the entire site. Each factory and company that fell under the environmental permit got a partial permit. Chemelot Site Permit B.V. consisting of SABIC, Sitech Services, the other partial permit holders (Vereniging Overige Site Users [VOS]) and DSM/ Chemelot as owner of the ground, became the permit holder (Chemelot B.V., 2014). A direct line of communication between Chemelot Site Permit B.V. and the government of Limburg was established (Chemelot B.V., 2013b). A direct line of communication and the creation of the Chemelot Site Permit B.V. were part of a changing strategy that the government of Limburg imposed. The government of Limburg was slowly letting go of the subsidizing and facilitating strategy (M. Lambriex, personal communication, 1 April 2014) and more towards investing and connecting strategy. Investing and connecting was more in line with the triple helix thought. To foster the cluster and campus development local - and the regional government(s) and industry should cooperate more and brides between them should be built to develop more union between them (Provincie Limburg, 2010b, p. 14-15).

After the provincial elections in 2007, the new Provincial Executives continued the Versnellingsagenda (F. van Lissum, personal communication, 14 January 2014). Cluster development was still important and the core of the new Versnellingsagenda however the Versnellingsagenda 2008-2011 differentiated from the first one in two important ways.

The first reason was the change of leading actor in the campus development. The government of Limburg identified itself as the leading actor during the first years of Versnellingsagenda due to a lack of belief and hesitation from other actors (Provincie Limburg, 2004a). During the second Versnellingsagenda the lead was handed of too DSM. This was a wish of the government of Limburg (Gedeputeerde Staten, 2009) as the government did not possess the

necessary knowledge to guide the campus development on content (E. Bakker, personal communication, 16 January 2014).

The second reason was that the concept of campus development became tied into cluster development and the possibilities to tie campus development as a concept with different policy area's such as the physical environment, labor market, economic policy and innovation policy was explored (van Elmpt, 2011, p. 129). The concept of campus development together with the concept of open innovation, mentioned by DSM and the government of Limburg in the Versnellingsagenda 2005-2008, became tools to tackle the vacant real estate, the regional connection of DSM and other large companies and how the government of Limburg could stimulate this development (Kooij, 2013, p. 4). In practice the emergence of the concept of campus development was more terminology change than an actual practice change. The campus development of the Chemelot campus within the chemical cluster was so grand compared to other projects that campus development was the central concept from the start (Provincie Limburg, 2005a; Provincie Limburg 2005b; F. van Lissum, personal communication, 14 January 2014).

In 2008 the term campus was further explained. The government of Limburg concluded that the definition of a campus is a broad and vague one and is often used as a marketing tool (Statencommissie voor het economisch domein, 2008). In order to distinguish between real campuses and business parks a clear definition was needed. The 2008 memo campusontwikkeling shed light on the matter and described the commitment of the government of Limburg for campus development. A campus was defined as a node where industry-government-knowledge institutions come together to create a flexible and knowledge intensive framework. A campus accordingly the government of Limburg should have:

- high quality physical infrastructure
- focus on R&D
- open innovation
- knowledge institutions on site
- Starter facilities
- Focus on new business development
- At the national level there should be support towards campus development

The government of Limburg identified two real campus developments: Chemelot campus and Healthcare campus Maastricht and other initiatives such as Greenport Venlo or Avantis in Heerlen/Aachen were not considered as such (Provincie Limburg, 2012a). The two campus developments could count on the support of the regional government. The commitment by the regional government was defined as facilitating and if necessary be the catalyst in campus developments. In practice this meant public funding for the two campuses (Statencommissie voor het economisch domein, 2008).

The government of Limburg did not only try to connect local actors to the campus but it actively reached out to the national government. Not only because the support from the national government was part of above listed criteria but it was part of their new strategy, expressed in the voorjaarsnota 2010 of investing and connecting (Provincie Limburg, 2010b). The support of the national government was a way to increase the critical mass of the campus development and help to connect large companies to the region. Especially to connect DSM to the region was a mayor consideration to actively search for national governmental support (Provincie Limburg, 2009).

The public servants of the regional government actively searched out the national government to inform them about the developments regarding the development of the campuses (Kooij, 2008, p. 4). This worked as two reports conducted for the ministry of economic affairs identified the Chemelot campus as a mature campus and more importantly the national government marked the Chemelot campus as a campus of national interest (BCI, 2009; Boekholt, Nagle & Zuijdam, 2009). This provided additional attention and opened up a new network and public funding (Kooij, 2008, p. 4). The additional attention, the recognition from the national government and the reaching of prior acquisition targets demised the initial skepticism slightly but doubts were still present as acquisition targets were still cautious (Wagemans & Przybylski, 2011).

The forming of the triple helix was drastically slowed down during the period of the second Versnellingsagenda (F. Schaap, personal communication, 4 April 2014). The transition towards a triple helix model relies on a new set of beliefs that must be shared by the actors (Metcalfe in Hanusch & Pyka, 2007, p. 945). M. Eurlings and his successor representative H. Vrehen shared the beliefs that the Chemelot Campus could be successful and that it as a great opportunity. The same could be said for J. Sneijders of DSM, he too shared this belief and saw the potential for DSM and he made sure that DSM's commitment intensified (F. Schaap, personal communication, 4 April 2014).

In 2009 when representative H. Vrehen stepped down (Dohmen & van der Steen, 2009) J. Kessels took over as representative and he did not share the same vision as his predecessor and tremendously slowed down the process. His two predecessors were the leaders that the government needed in order to change. The government has a large civil service apparatus with different beliefs. Older civil servants may hold different beliefs regarding existing organizational structures, policy wise and political views than younger civil servants. Politicians have different beliefs and struggle with dividing the interests of their voters and doing what needs to be done (R. Joosten, personal communication, 27 February 2014). M. Eurlings and H. Vrehen were actively changing the governmental belief system and getting everybody on board. Representative J. Kessels invoked a different belief set and slowed down the transition as any transition need a new set of beliefs in order to get the support that is needed to let go of the old structures and embrace the new transition towards the triple helix (Metcalfe in Hanusch & Pyka, 2007, p. 945). He was more interested in small and medium businesses [SMB] and was suspicious towards DSM (F. Schaap, personal communication, 4 April 2014) and he took a long time to come around before he realized the importance of the Chemelot campus.

Another hinder to the development of the campus was the UM. The UM started to share the beliefs of DSM and the government of Limburg and started to get involved in the development of the Chemelot campus, however part of the deal was an investment in real estate. J. Ritzen, president of the board of directors said in an interview with a local newspaper that the UM would never invest in real estate (F. Schaap, personal communication, 4 April 2014). On 6 June 2009 the UM officially withdrew a €50 million investment in real estate. They would stay involved in the knowledge development of the campus (Gedeputeerde Staten, 2009).

4.3 THE BEGINNING OF THE TRIPLE HELIX

In 2010 the government of Limburg, together with DSM and the University of Maastricht [UM] signed the first contracts regarding the development of a landlord organization for the Chemelot campus. The landlord organization would be called Chemelot B.V (Provincie Limburg, 2010a). This landlord organization, first mentioned in the second Versnellingsagenda (Raad van advies versnellingsagenda,

2008, p. 33) was needed to make the next step in the development of the Chemelot campus. Certain campus developments needed an organization that was knowledgeable and able to invest and manage quick and decisively. The government was willing to invest but had the problem of long decision making trajectories and DSM and UM had their own interest and all of them did not possess the knowledge required to manage campus development (H. Daniels, personal communication, 8 January 2014). The Chemelot B.V. marked a change in the participation of the government of Limburg in the development of the Chemelot campus. Before 2010 the government of Limburg participation was limited to facilitating, through loans and mostly subsidies (Kooij, 2013, p. 5).
The signing of the first contracts was significant for a couple of reasons. The first reason was that this was a major step in the profiling of Limburg as an important region within Brainport 2020, the national economy and Europe (Provincie Limburg, 2008).

Secondly it was the first step in formalizing the transition towards a triple helix model (Wagemans & Przybylski, 2011, p. 3). Marking a definitive change in the role that the government has in the development of the campus, that role changed from facilitator in 2004 to investor and shareholder in 2010 (Wagemans & Przybylski, 2011, p. 10).

The final reason was that the initial doubts about the development of the Chemelot campus were gone and all three major actors, UM, DSM and the government of Limburg all shared the same set of beliefs and realized that the transition that started in 2004 provided a chance to further stimulate the regional knowledge based economy. Since the start in 2005 the campus has attracted 32 companies and several hundreds of jobs and the founding of the Chemelot B.V. should speed up this development (Provincie Limburg, 2010a). The landlord organization would be tasked with the following goal:

"The development of the Chemelot Campus into the Euregional and International location for firms, knowledge- and research institutions in CHEMaterials (Wagemans & Przybylski, 2011, p. 2)*".*

During the development of plans for the period 2010-2020 the government of Limburg used the campus definition by Buck consultants international which includes four key criteria a campus must fulfill: high quality physical infrastructure, focus on R&D, open innovation and knowledge institutions on site (F. van Lissum, personal communication, 14 January 2014). These four criteria would be used to build the campus and identify weaknesses that needed to be addressed. It was the task of the landlord organization to ensure and oversee and steer the development of the campus using these four criteria. The landlord organization named: the Chemelot B.V. would have the authority to act and invest on behalf of the three founding fathers in acquisition, marketing & business development, venturing and real estate (Wagemans &Przybylski, 2011, p. 2-3).

In 2011 the Consortium Chemelot Campus Masterplan 2010- 2020 was finalized (Wagemans & Przybylski, 2011). The masterplan was translated into several business plans and four of those plans were discussed and approved for funding by the "Provinciale Staten" at the start of 2012: these funds were for the real estate of the Chemelot campus, the participation of a new venture fund (Limburg Ventures II), the development of a Science program and the establishment of advanced shared services on the Chemelot site (Enabling Technologies) (Kooij, 2013, p. 4). These plans were the first real initiatives that showcased the government of Limburg as an investor and embedded the UM definitely to the region.

The first plan was the establishment of Limburg Ventures II, a venture capital fund with €40-55 million capital, invested by government of Limburg, NV Industriebank LIOF, DSM, the Rabobank

and Particon. The wish was an additional investment by the national government of €30 million (Provincie Limburg, 2011a). It turned out to be a venture capital fund with €40 million in capital invested by government of Limburg, NV Industriebank LIOF, DSM and the Rabobank (Chemelot Ventures, 2014). The name is changed from Limburger ventures II to Chemelot Ventures to better emphasize the relation between the fund and the Chemelot campus. Chemelot Ventures is a prime example of the shift that the government made from facilitator towards investor and it showcased the development of the triple helix as both DSM and the government of Limburg legally committed themselves to each other and to the campus development (Provincie Limburg, 2012e).

The second plan was the development of a science program. This plan ensured that the UM committed itself to the campus (Provincie Limburg, 2013d) and finalizing the triple helix, as all three institutions: industry-government-knowledge institutions had committed themselves legally to the campus (Leydesdorff & Etzkowitz, 1998, p. 196). For the development of the science program by the UM, the government of Limburg was asked for funding and the government of Limburg approved this request. On 2 March 2012 the government of Limburg subsidized €15 million for the development of the science program. The €15 million in subsidy was a setback in the transition from subsidizing towards investing.

The reason the governmental funding consisted of subsidies was the rush the government had to tie the UM to the campus (Provincie Limburg, 2013b). The focus up to this point of the UM was not directed at the region (F. Schaap, personal communication, 4 April 2014), in order to tie the UM more to the region the government of Limburg rushed this project and reverted back to old habits, namely subsidizing as this was the main financing instrument the government of Limburg used for many years (R. Joosten, personal communication, 27 February 2014).

The second reason is the lack of power the government has in executing its autonomous policy. The regional government depends on a variety of different partners to execute policy instruments because the government lacks a form of law making power to force change and policy execution (R. Joosten, personal communication, 27 February 2014). The different actors the government collaborates with, in this case the UM know this and use these power relations to their advantage. Especially the last reason is a common problem throughout the years and projects to come.

The development of the science program exposed another problem (Provincie Limburg, 2013d). The evaluation framework for these projects was absent. The new nature of the projects asked for an evaluation framework. This led to the appointment of three board members who were screened and approved by the government of Limburg and the UM accordingly with the newly developed internal standard (Provincie Limburg, 2013b; Provincie Limburg, 2013d).

The third project was enabling technologies, the next step in the development of high-tech R&D infrastructure (Provincie Limburg, 2013bb). The project wants to connect science with businesses, facilitate growth of SMB and make the campus more attractive. The government of Limburg, DSM Resolve and the UM are all three shareholder with each 33.3%. Each made an investment of €2.3 million besides the government who matches that investment with a loan of €2.3 million and a subsidy to cover the exploitation deficit during the first 5 years. In return DSM Resolve and the UM commit themselves to buying €16 million worth of services from the enabling technologies project (Provincie Limburg, 2013b; Chemelot B.V., 2012).

Again does the government revert to subsidizing and again for the same reason it has and will in future revert to subsidizing, the government is terrified that the campus development grinds to a halt and the potentially leaving of large companies (Kooij, 2013 p. 4-5; Gedeputeerde Staten,

2009). It is the asymmetrical power relations between the government-knowledge institutions and industry that prohibit or at least slow down the transition of the government from facilitator and subsidizer towards investor and participator. The fear of DSM leaving and the UM withdrawing from the Chemelot campus gives them a certain power over the government. DSM and the UM can force the government in reverting back in to old habits and structures, namely subsidizing. The government reverts back to subsidizing in their rush to get projects approved (Provincie Limburg, 2013b), DSM and the UM can steer the regional government towards subsidizing as this is an old financing instrument they are used too (M. Lambriex, personal communication, 1 April 2014). The current institutional framework has not co-evolved to the point where all DSM-UM-government of Limburg are equal, hence giving DSM and the UM the power to retain historically formed structures and preserving at least a part of the past institutional paradigm (Dosi, 1982, p. 151-153).

4.4 The Chemelot B.V.

As of 2012 the Chemelot campus B.V. is finalized and working (Provincie Limburg, 2013a, p.15). The three founding fathers: UM, DSM and government of Limburg would commit themselves financially and intellectually for the next 10 years to the development of the Chemelot campus (Wagemans & Przybylski, 2011, p. 10). The 10 year commitment combined with the establishment of a legal entity would ensure a continuation of previous efforts, connect knowledge institutions and industry to the campus and would boost the development of the Chemelot campus. The required financial means were suddenly present. Chemelot B.V has its own budget and can invest more decisively and faster. The business development team can invest accordingly their own judgment and is no longer dependent on the complex and often slow decision making processes of the government of Limburg and DSM. The campus was not a core activity for DSM until the founding of the Chemelot campus B.V (F. Schaap, personal communication, 4 April 2014). Furthermore would the landlord organization ensure that a common vision was established and protected (Wagemans & Przybylski, 2011; H. Daniels, personal communication, 8 January 2014).

That the Chemelot B.V. is operational and functioning means several things: (1) the government is officially a shareholder and the transition from facilitator is formalized, (2) the triple helix is formalized. Within Each shareholder has a different role within Chemelot B.V.

- UM/MUMC+: role of leading knowledge institute, starting from education and research knowledge is marketed and a connection with businesses is formed
- DSM: entrepreneurs role, generating business through and stimulating valorization from business to business
- Government of Limburg: investing in knowledge and business, investing or subsidizing when market failure occurs (Wagemans& Przybylski, 2011, p. 2)

After 8 years the transition of the regional economy, which started with DSM's Copernicus strategy and sale of the petrochemical division, has been officially for malized. The change from facilitator towards shareholder is on paper completed. However there are several things that need to be resolved in order to truly transition towards a triple helix model.

First is the division of labor between the three founding fathers, this strict division counteracts the triple helix model (Etzkowitz, 2003, p. 295) as it strengthens boundaries between institutions (Gedeputeerde Staten, 2009) and makes for a rigid institutional framework.

Second, the market failure arguments persist, which is based on neoclassical assumptions (Metcalfe, 2003, p. 10). Policies designed based on the market failure argument have proven to be too rigid to deal with uncertainty, which is inherent to innovation and transition (Sovacool, 2010, p. 925). This does not mean that everything is solved. There are still questions regarding governance of the founding fathers. Each founding father has the right to appoint a commissioner. The government of Limburg foresaw this development and developed guidelines "Sturing in samenwerking" (guidance in cooperation). In this document the government named the three roles that the government of Limburg can have within a corporation: shareholder, CEO or commissioner. The government should not be represented by a public servant, representative or a member of the "Provinciale Staten" that is employed by the government of Limburg. A person outside the organization should represent the government of Limburg (Gedeputeerde Staten, 2012), while DSM and the UM named a person inside their organization to represent them. M. Lambriex argued that it is better to appoint a person outside the organization to prevent a conflict of interest but it is logical that DSM and the UM appointed a person inside their organization. For DSM and the UM this is a new development, for this reason a learning curve is expected and that goes hand in hand with making mistakes and learning.

Another important transition is the way the government funds the Chemelot B.V.. The Chemelot B.V. is organizational funded, the organization gets the funding and has the authority to invest according own insight. It marks a turn in funding as the government has always funded individual projects instead of organizations (Provincie Limburg, 2012d, p. 5; R. Joosten, personal communication 27 February 2014).

Plus the funding is a prime example of the triple helix in practice. Etzkowitz (2003) argues and Figure 1 shows that hybrid organization and trilateral networks can emerge when government-industry-knowledge institutions find common ground. The Chemelot B.V. is such a hybrid organization, it emerges there where DSM, UM and the government of Limburg share common ground and the three parties came together, each funded 33.3% of the hybrid organization and ensured that all three parties had equal say in the way it should be spend (Wagemans & Przybylski, 2011, p. 2).

Simultaneously with the founding of the Chemelot B.V., a separate C.V. was founded to manage the real estate of Chemelot. Chemelot Vastgoed C.V. was founded on 16 October 2012 (Provincie Limburg, 2013a), the establishment of the Chemelot Vastgoed C.V. required to an investment of €77 million for the period 2010-2019. The €77 million will be invested by the government of Limburg 80%, UM 10% DSM 10% and borrowed capital from financial institutions.

Secondly the government of Limburg would invest almost €6 million in a "leegstandsfonds" (vacancy fund) that would cover the exploitation deficits of the Chemelot Vastgoed C.V. (Statencommissie voor het Economisch Domein, 2011, p. 9). It should be noted that negotiations with financial institutions at the moment that these plans were approved by the "Provinciale Staten" were ongoing and additional investments by the government of Limburg could be necessary. In February of 2013 had to invest an additional €43.5 million due to market failure (Provincie Limburg. 2013b).

What market failure is, is not clearly defined. In the Consortium Chemelot Campus Masterplan 2010- 2020 the term market failure is mentioned five times yet never explained (Wagemans & Przybylski, 2011). In the case of the additional €43.5 million for the Chemelot Vastgoed B.V. it is briefly mentioned that traditional investors are absent (Provincie Limburg. 2013b). This vagueness ensure DSM and the UM the power to use the market failure argument to force the

government to make risky or unprofitable investments. The government of Limburg has committed itself to invest or subsidize when market failure occurs (Wagemans& Przybylski, 2011, p. 2).

The 80% investment in real estate by the government was not done willingly (Statencommissie voor het Economisch Domein, 2011, p. 8). The real estate on site was almost completely written off (F. van Lissum, personal communication, 14 January 2014). Due to market failure the government of Limburg was forced to invest in real estate (Wagemans & Przybylski, 2011, p. 64). As a result the government of Limburg would invest for 80% in real estate and the two other parties each 10%. The provincial Executive realized that they miss the knowledge on governance structure and real estate. External advice was required and the government reserved €300.000 for this. This advice was needed urgent because the process could not be delayed (Provincie Limburg, 2011c).

The members of the "Provinciale Staten" criticized the investment as it was financing DSM's written off real estate. Several members of the "Provinciale Staten": Muijs (VVD), Gordijn (CDA), Clerx (PvdA) etc. posted questions concerning the contribution of the Chemelot campus towards the regional embedding of the knowledge economy, DSM's involvement in the region and financial risks involving the 80% investment in real estate. DSM's corporate strategy for the near future was unknown and DSM's desire to get rid of its real estate could hint towards a retreat from the region (Statencommissie voor het Economisch Domein, 2011, p. 8).

This leads to the logical question: Why would the government of Limburg take that many financial risks? The main reason for investing in the Chemelot campus according to the documents that were made public is the positive effect the Chemelot campus would have on the regional economy (Wagemans & Przybylski, 2011, p. 2-3). Around 1000 fte for knowledge workers would be created over a 10 year period. The Chemelot campus has 1064 fte for knowledge workers divided over 43 businesses and knowledge institutions. By 2020 that number must be 2000 fte for knowledge workers and 65 additional business and knowledge institutions (Provincie Limburg, 2012c, p. 8). 1 fte for a knowledge worker represents an investment in the region of €175.000 and 8-10 additional fte (M. Lambriex, personal communication, 1 April 2014; Statencommissie voor het Economisch Domein, 2011, p. 8; Wagemans & Przybylski, 2011).

However behind the scenes there were other important reasons to invest so heavily in real estate. The first reason was that the Provincial Executive announced to the "Provinciale Staten" that DSM could leave the region if the government of Limburg did not invest in real estate (Statencommissie voor het Economisch Domein, 2011, p. 8). The fact that DSM can leave the region influences the decision making process of the regional government (Kooij, 2013, p. 4-5) and is counteractive to the development of the triple helix. Central to the triple helix is the blurring of boundaries between government-industry-knowledge institutions and institutions assuming roles of different institutions (Etzkowitz, 2003, p. 295). DSM and the UM both use the asymmetrical power relations to maintain old structures and stick to their core business, refusing to blur their boundaries and take on different roles. DSM ability to leave and UM refusal to invest in real estate as they saw themselves not as investor but as educators and researchers, made that the government of Limburg took great financial risks to connect those two parties to the campus (Gedeputeerde Staten, 2009).

The second reason was the persistent market failure argument (Hartmann, et al., 2008, p. 2). The regional government could not transition fast enough to shed the neoclassical market failure doctrine as the role of the regional government within the triple helix is: subsidizing or investing in cause of market failure (Wagemans & Przybylski, 2011, p.2). Due to this hard concession from the government of Limburg, the government has very little choice but to act upon market failure.

A related economic program to the campus development is the program “kennis-as Limburg” (H. Daniels, personal communication, 17 January 2014). “Kennis-as Limburg” is a collaboration between the UM, Zuyd Hogeschool, Chemelot B.V. and Health Campus B.V., an initiative by the UM and Zuyd Hogeschool to combine forces and expend their activities, see figure 2 (Maastricht UMC+ et al., 2013, p. 7).

Maastricht University and Zuyd Hogeschool invest €162 million in the regional knowledge economy and asked the government of Limburg to match that number: €180 million (Provincie Limburg, 2013c). The government of Limburg was further asked to lobby to help European and national funding (Maastricht University & Zuyd Hogeschool, 2013). Two projects in which the government participates are the Institute for Science and Technology [InSciTe] and Chemelot Innovation and Learning Labs [CHILL]. Both are located at the Chemelot campus and are discussed later on in the paragraph.

In order to secure national and European funding, the large municipals in the region southwest Netherlands joined forces to promote themselves as one region (Department of economics and Innovation, 2014b). In essence it is an expansion of the already existing Limburg Economic Development [LED] network. LED is one of the leading parties in Brainport 2020. Brainport 2020 connects and builds upon pre-existing governance networks (Provincie Limburg, 2011b, p. 3).

Brainport 2020 is a triple helix initiative, connecting industry-government-knowledge institutions from south east Netherlands, however representative Beurskens, tasked with LED thinks not highly of LED and does not full-hearted believes in LED (Department of economics and Innovation, 2014b). One of the reasons is that they claim too much credit for projects and credit not enough other parties (Department of economics and Innovation, 2014b). Beurskens as a politician struggles with claiming enough credit, as he must have short term accomplishments to communicate towards his voters and doing the right thing for the greater good (R. Joosten, personal communication, 27 February 2014). Finding a compromise can prove difficult and time consuming and can be impossible in some cases (Metcalfe in Hanusch & Pyka, 2007, p. 945)

A second hurdle that Brainport 2020 must overcome is the possible advantages position that the UM has within the campus development in regard with other knowledge institutions and if this is beneficial or not. The UM has managed to negotiate a position[2] which gives it a certain power to stop or at least slow down certain campus developments (Department of economics and Innovation, 2014b). Coming back to the government support of the “kennis-as” program, the government of Limburg will support the initiative as it is a great way to connect the UM to the region. The focal point of the UM was not always focused on the region, the government hopes that via this program and the campus development that will shift (Department of Economics and Innovation, 2014b).

The two projects the government participates in that are part of the “kennis-as Limburg” are CHILL and InSciTe (Maastricht University & Zuyd Hogeschool, 2013). The first project is CHILL. This project is a collaboration between Zuyd Hogeschool, UM, DSM, SABIC, Sitech, Arcus and Leeuwenborgh. The funding comes almost completely from the government of Limburg, the government of Limburg subsidizing annually €175.000,00 till the year 2017. The project connects businesses and students, businesses who have a research question can hire students to answer those

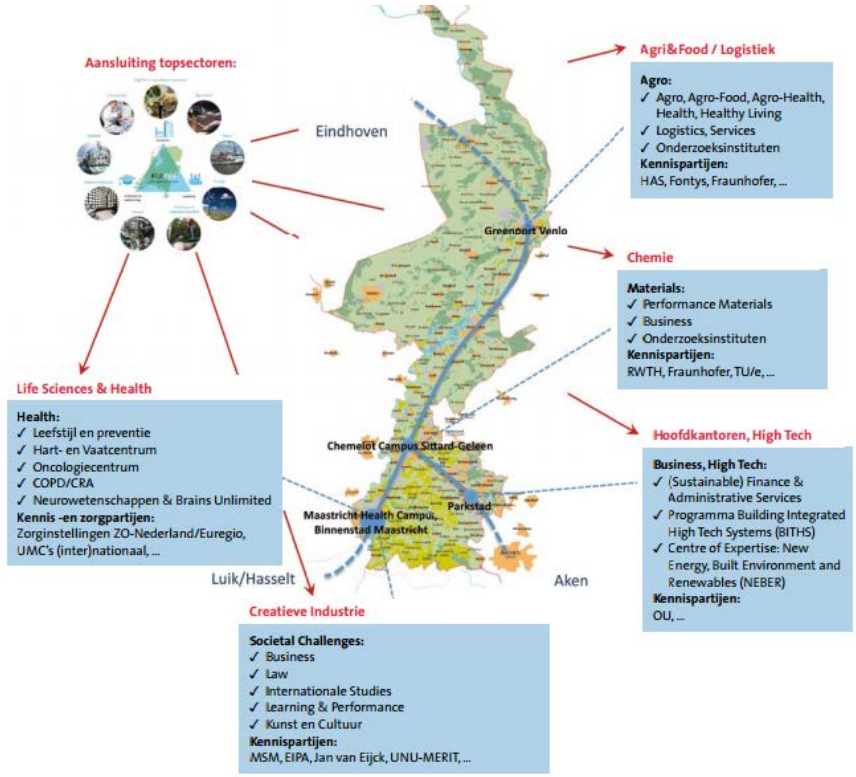
[2] Unfortunately is information regarding this topic classified, making it not possible to specify any more details

questions. This is less expensive for the businesses and students get real life experience (Provincie Limburg, 2012b).

The second project is InSciTe. InSciTe is an initiative from DSM, UM, Maastricht University Medical Center [MUMC+], TuE and Chemelot B.V. to establish a research institute for biobased- and biomedical materials. Each of these parties signed a letter of commitment to pursue the government of Limburg to invest in InSciTe (Provincie Limburg, 2014b). The letter of commitment is important to the government. This connects non regional parties to the region and helps connect regional parties to the campus (Provincie Limburg, 2014d, p.25).

The government decided to approve €30 million in funding for InSciTe (Provincie Limburg, 2014b), although the "Provinciale Staten" expressed its desire to move away from subsidies and towards investments, a move which is supported by Chemelot B.V. (M. Lambriex, personal communication, 1 April 2014; F. Schaap, personal communication 4 April 2014). They decided that 80% of the funding consists of subsidies and 20% investments with a potential financial return (Provincie Limburg, 2014a, p. 26).

Figure 2: Kennis-as Limburg and topsectoren



(Maastricht University & Zuyd Hogeschool, 2013, p. 8)

In February of 2014 the "Provinciale Staten" approved the "7 structuurversterkende projecten"; three of these projects are related to the Chemelot Campus (Provincie Limburg, 2014a). These projects are InSciTe, the pilot plant facilities and the Chemelot material center. The pilot plant facilities and the Chemelot material center are part of the accelerated case. The accelerated case was developed because the "Provinciale Staten" asked if the Campus development could be accelerated as they feared that the national government would force the local government into

"schatkistbankieren". The government had €1.2 billion in "Essentgelden" and wanted to invest that in the region (H. Daniels, personal communication, 17 January 2014). The accelerated case should lead to an increase in knowledge workers from 2000 to 2500 in 2020 (Chemelot B.V., 2013, p. 8).

The pilot plants facilities, an initiative to build three pilot plants in order to provide businesses on the Chemelot campus and in the region with a place to use pilot plants facilities without having to do a large investment (Chemelot B.V., 2013, p. 12-13). The project tries to build a bridge between the research lab and full scale plant facilities. Especially in the field of biobased- and biomedical materials are a lot of opportunities for pilot plant facilities. The parties, who invested in InSciTe, support the pilot plant facilities however they are not ready to invest (H. Daniels, personal communication, 8 January 2014). Sabic, DSM and Avantium have serious objections in financing projects for others, due to this attitude the government of Limburg was forced to fund the €46 million alone, 50% investing and 50% subsidizing (Chemelot B.V., 2013, p.2, 14-15).

Again, the asymmetrical power relations between the different actors cause the government to take full responsibility and use subsidies. The government of Limburg spoke out their desire to move away from subsidies towards investments as investments fit better in the profile of an investing and active participating government (M. Lambriex, personal communication, 1 April 2014; F. Schaap, personal communication 4 April 2014). The suggested governance structure for the pilot plant facilities is the establishment of a new legal entity which is owned by the government of Limburg and the Chemelot B.V. becomes the managing partner. That ensures that the project is guided by knowledgeable individuals and to create equal power relations (Chemelot B.V., 2013 p. 18-19; R. Joosten, personal communication, 27 February 2014).

The second project of the accelerated case is the Chemelot material center, a project by Chemelot B.V., Dutch Polymer Institute, SABIC and Lanxess is not definite yet. The government of Limburg reserves €15 million for the Chemelot material center, which will be invested as soon as the different parties have spoken out their commitment. SABIC is the deciding party, SABIC is currently investigating locations in Europe to cluster their research and development activities (H. Daniels, personal communication, 17 January 2014). Should SABIC choose for the Chemelot campus than the government will invest the €15 million, see table 3 (Chemelot B.V., 2013, p. 4).

Table 3: Investments accelerated case

Investments	**Founding fathers**	**Government of Limburg**	**Third Parties**	**Total**
CMC	€15 M	€15 M	€25 M	€55 M
Pilot plant		€46 M	€62-77 M	€108-123 M
Total	€15 M	€61 M	€87-102 M	€163-178 M

(Chemelot B.V., 2013, p. 4)

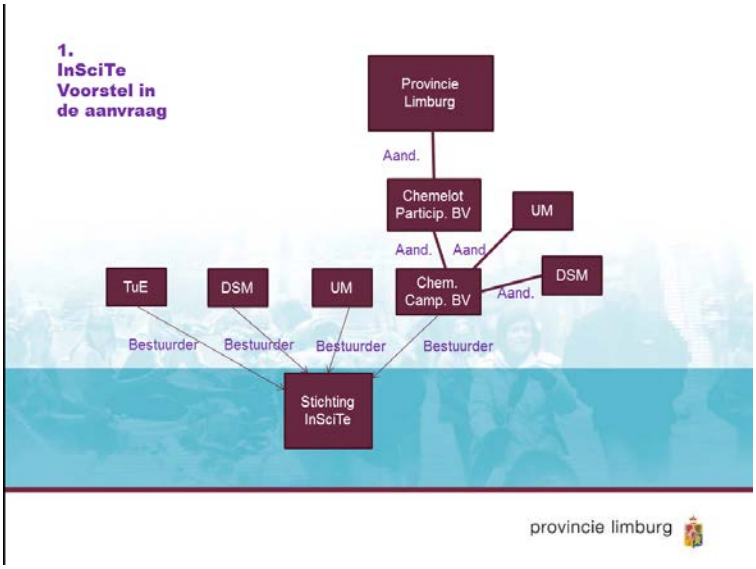
The projects were approved by the "Provinciale Staten" in February, but not without a struggle (Provincie Limburg 2014c). Several members of the "Provinciale Staten" had comments and questions that needed answering. Especially the large investments made by the government of Limburg in comparison to the other direct parties were a troublesome point. CDA, Bosman and D66 had second thoughts when it became clear that the majority of the investments were nothing more than subsidies. Groenlinks commented that subsidies were against the earlier outspoken desire of the government to stop subsidizing. D66 even said that no alternatives were even considered (Department of Economics and Innovation, 2013). The "Gedeputeerde Staten" argued that any delay

would jeopardize the fragile momentum and partnership between the UM and the TuE. In order to connect those two knowledge institutions to the region the regional government had no choice but to subsidize (Provincie Limburg 2014c).

As with InSciTe the financial returns of the investment made in the Chemelot material center is harder to predict (Chemelot B.V., 2013 p. 32). The financial returns have to come from patents and the intellectual property rights. The problem is how do you governance such projects? Virtually every interviewee answered that the government of Limburg does not have the knowledge required to governance such projects. H. Daniels (2014) explained during a team presentation that the government of Limburg does have some knowledge regarding triple helix governance but the knowledge is spread among a variety of people and departments and therefore very inaccessible. This is logical as old organizational structures are not designed to cope with the campus development and triple helix model (H. Daniels, personal communication, 8 January 2014).

Hence those individuals who do not possess the required knowledge and are not familiar with the triple helix and fall back in old habits and structures such as subsidies (Daniels, 2014).
Slowly but surely does the required knowledge spread amongst civil servants, an example is given in the figures 2, 3 and 4. They show the evolution of the governance structure for InSciTe (Daniels, 2014).

Figure 3: Current governance structure



(Daniels, 2014)

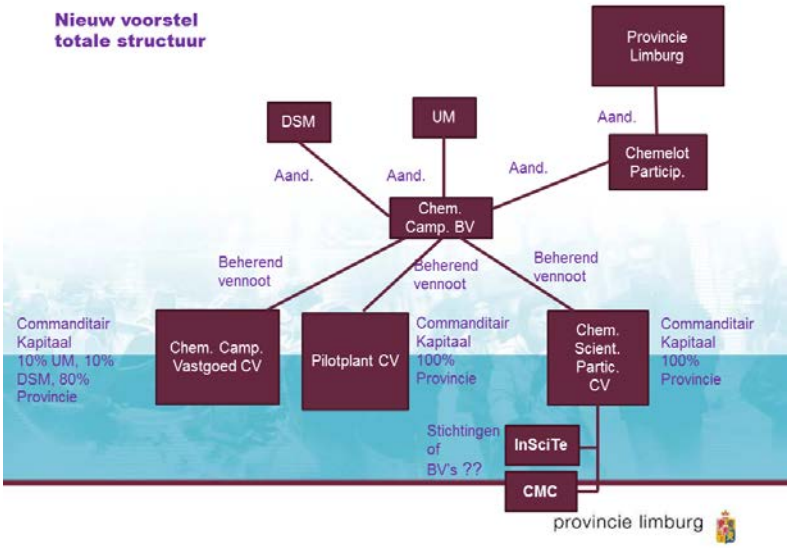
The current situation, shown in figure 3, is the current governance structure for the project InSciTe. This is a prime example of the development of the triple helix. In the current situation the government of Limburg invests directly in InSciTe yet it has no direct influence. Knowledge institutions and institutions from the industry have direct influence as they are managing partners of the foundation InSciTe. Besides that DSM, UM have indirect influence as they are together with the government of Limburg shareholders of the Chemelot B.V. which is also a managing partner in the foundation InSciTe.

The reason is that old organizational structures still remain and are hard to change and overcome (Dosi, 1982, p. 151-153). The UM and DSM are used to a government that facilitates and not participates directly (M. Lambriex, personal communication, 1 April 2014). That paradigm is kept intact by using the asymmetrical power relations between government-industry-knowledge institutions (Brinkley, 2006, p. 5). DSM and the UM use the political pressure that the regional government feels to create employment to force the government in investments that they do not want to make (Kooij, 2013, p. 4-5; Gedeputeerde Staten, 2009).

Secondly the government lacks the necessary knowledge to deal with the current situation (Metcalfe in Hanusch & Pyka, 2007, p. 945). H. Daniels (2014) mentioned that the necessary knowledge is absent and the knowledge that the government has is inaccessible.

The third reasons is that the government is completely dependent on DSM, UM and other relevant actors to execute their policies. Without the compliance of DSM, UM and TuE, the government of Limburg is helpless. This grants them the power to set demands in return for their compliance (R. Joosten, personal communication, 27 February 2014).

Figure 4: New proposition governance structure



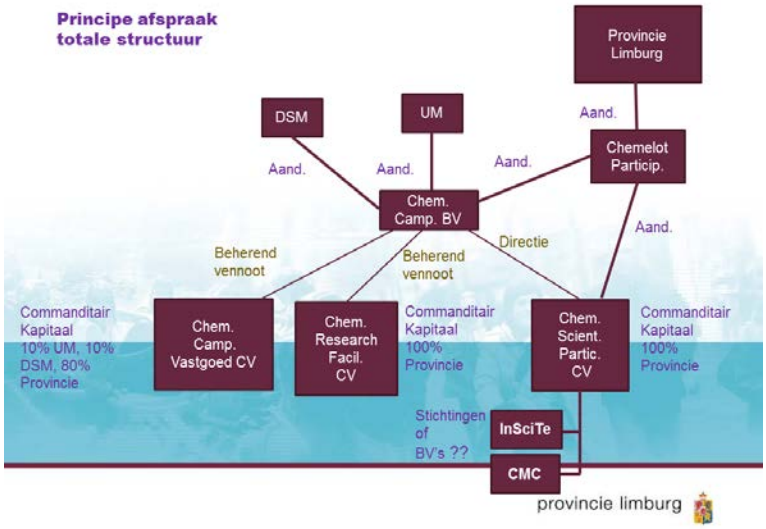
As the relevant actors get used to working within a triple helix model, increased knowledge and feedback from earlier performances and decision start to change the institutional paradigm (Dosi, 1982, p. 151-153). The Chemelot B.V. is the bridge between the three founding fathers and this is where the blurring of boundaries is greatest. This hybrid organization is the breeding ground of the set of values and knowledge required to drive the transition forward (Daniels, 2014) towards the triple helix (Etzkowitz & Leydesdorff, 2000, p. 111). Through the Chemelot B.V. the three founding fathers communicate with each other and it is the Chemelot B.V. where the rules that shape each organization, jargon and the focus on internal procedures are transformed into a common language (Etzkowitz, 2003, p. 299). The regional government uses the Chemelot B.V. to transition towards a more equal partner, by reshaping the governance structure of projects, such as: InSciTe.

The proposed governance structure tries to break down the rigid division between the three institutional spheres that is defined in the masterplan (Wagemans & Przybylski, 2011, p. 2; Daniels, 2014). The boundaries of the government are starting to blur and the government is taking on a more business and investor role. The blurring of boundaries is a central principle within the triple helix (Gibbonds et al., 1994 in Leydesdorff & Etzkowitz 1998, p. 196; Etzkowitz, 2003, p. 295). But it is not yet complete. Although the government invests directly in InSciTe, it is not a direct shareholder nor has it direct influence.

Figure 5 is the preferable governance structure that the government of Limburg wants (Daniels, 2014). The governance structure of figure 5 is the next step in the transition towards the triple helix. The older rigid boundaries and structures are becoming weaker and replaced with new triple helix inspired organizational structures. The blurring of boundaries has become greater and the government has taken on the role with firm-like characteristics. The government of Limburg

becomes a direct shareholder of Chemelot Science Participation C.V. and gains direct influence in the invested projects such as InSciTe. Feedback from previous decisions and amassed knowledge are changing organizational structures (Dosi, 1982, p. 151-153; Metcalfe in Hanusch & Pyka, 2007, p. 945). The greater understanding and knowledge enables the government to work better within the triple helix but also DSM and the UM. Over time the new set of values and knowledge spreads among individuals.

Figure 5: Most preferable governance structure



(Daniels, 2014)

5. Conclusion

This chapter presents the answer to the main research question that was formulated in the first chapter. This answer is given by presenting the analysis of data from the fourth chapter in short which leads to an answer of the main research question. The main research question is:

What is the role of the government of Limburg in stimulating the knowledge economy on the Chemelot campus and to what extent has the founding of the Consortium Chemelot B.V. led to a transformation of this role?

The regional government had a leading role in getting the campus development started in the years 2004-2008 (Provincie Limburg, 2004a). Representative Eurlings saw the potential of the campus development for the regional economy and tried to pass on that belief to relevant actors (van Elmpt, 2011, p. 126-128; F. van Lissum, personal communication, 14 January 2014). The belief that M. Eurlings had in the campus development was translated into the Versnellingsagenda. The Versnellingsagenda was a reflection of a new set of beliefs and these new beliefs could rise to new institutional structures (Taskforce Versnellingsagenda, 2005). In practice the regional government would invest €10 million in 2006 (Taskforce Versnellingsagenda, 2005, p. 49).

During the period of the second Versnellingsagenda 2008-2011, the government of Limburg started to focus more on the Chemelot campus and the Maastricht Health campus (Raad van advies Versnellingsagenda, 2008; Buck Consultants International, 2009). However a couple of problems arose which slowed the campus development down (F. Schaap, personal communication, 4 April 2014). In 2009 when representative H. Vrehen stepped down (Dohmen & van der Steen, 2009) J. Kessels took over as representative and he did not share the same vision as his predecessors and tremendously slowed down the campus developments. He was suspicious towards DSM (F. Schaap, personal communication, 4 April 2014) and he slowed down the transition by remaining stuck in old manners and beliefs, these prevented the emergence of new institutional structures (Metcalfe in Hanusch & Pyka, 2007, p. 945).

The UM was also struggling with the demands of the campus development. The UM did not see itself as a real estate investor and held on to the traditional division of labor between government-industry-knowledge institutions (Gedeputeerde Staten, 2009). The lack of belief regarding blurring of boundaries undermined the triple helix (Etzkowitz, 2003, p. 295) and campus developments as a solid commitment from the UM took more time than expected.

In fact the real estate investment from the government in 2011 is a great example of the fragility of the campus developments. The threat of DSM leaving (Statencommissie voor het Economisch Domein, 2011, p. 8) and the refusal of the UM to invest in real estate forced the government to fund the real estate for 80% and the two other parties each 10% (Gedeputeerde Staten, 2009).

The Chemelot B.V. changed the role of the government of Limburg drastically. The first change was from facilitator and subsidizer (F. van Lissum, personal communication, 14 January 2014) towards shareholder and investor (Wagemans& Przybylski, 2011, p. 2). The second change was the legal commitment of DSM, UM and Government of Limburg. This provided a lot more stability and on paper at least it ensured more even power relations between the three.

However the changes that were mentioned in the previous subsection are predominately on paper. The UM and DSM still hold such power over the government of Limburg that the regional government is forced to make risky investments and even use subsidies as a financing instrument in

order to keep the campus development going (Provincie Limburg 2014c). The accelerated case approved 7 February 2014, total funding €61 million of which €46 is subsidy (Chemelot B.V., 2013, p. 2-4), because other parties refused to invest (H. Daniels, personal communication, 8 January 2014).

The argument of market failure remains an integral part of division of labor between the three founding fathers as the role of the regional government within the triple helix is: subsidizing of investing in cause of market failure (Wagemans & Przybylski, 2011, p.2). Due to this hard concession from the government of Limburg, the government has very little choice but to act upon market failure. Hence giving the UM and DSM the opportunity to remain their old structures and limit the blurring of boundaries (Etzkowitz, 2003, p. 295) between the three and counteracting the triple helix (Gedeputeerde Staten, 2009; Department of Economics and Innovation, 2013.

Slowly but surely changes occur. Figures 3, 4 and 5 show how the triple helix is in constant motion and transition and how the three founding fathers are in the transition towards a triple helix model.

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APPENDIX I

Datum: 25-09-2013
Tijd: 09:00-10:00
Locatie: Limburgzaal
Aanwezig: Jan Maatjens, Edwin Bakker, Jean Severijns, Janneke Meulenbeld, Marga Poulssen, Bas Peusens, Huib Daniëls, Jorn Joosten
Afwezig: Erik Ritzen, Winnie Peeters, Cees de Jong, vanaf 09:45 Angélique Hendriks
Voorzitter: Bas Peusens
Notulist: Jorn Joosten

Agenda
1. Opening
2. Behandeling notulen vorig overleg
3. Informerende lijst
4. Sluiting

1. Opening
Bas Peusens opent de vergadering; geen bijzonderheden

2. Behandeling notulen vorig overleg
Aanmaken teamoverleg map voor alle documenten anders wordt het een dadelijk minder overzichtelijk naarmate meer teamoverleg documenten in de map team 2 worden gestopt. De map kennisdelen is hier in onder gebracht.
Voorlopig zullen notulen gemaakt worden (met de te ondernemen acties erbij vermeld), het is de bedoeling om dit te zijner tijd te vervangen door een actielijst.

3. Informerende lijst
De UM is aandeelhouder met provincie en DSM in Chemelot BV. Met het beleids- / strategiedocument de kennisas heeft de UM samen met de hogescholen een Limburgbrede propositie ontwikkeld. De discussie gaat over in welke mate de UM zich een voorkeurspositie ten opzichte van andere kennispartijen probeert te creëren en welke voor en nadelen dit heeft.

MHC
MHC is projectgestuurd. Bij Chemelot is een “package deal” ontwikkeld, bij MHC wordt nu gekeken of de projecten via een integrale gebiedsgerichte aanpak in een bredere context kunnen worden ontwikkeld. In de meest vergaande variant die nu bestudeert wordt moeten UM en gemeente Maastricht hun gronden inbrengen in een gemeenschappelijke organisatie.

Maakindustrie
In 2012 is een aanvraag ingediend bij de Europese Commissie, DG Enterprise and Industry, om als provincie Limburg aangewezen te worden als één van de zes model demonstrator regions in Europa op het gebied van Services Innovation (ESIC). De aanvraag is opgesteld door een samenwerkingsverband van UM, SSF, Canon/Océ, LIOF, Syntens/KvK en Provincie. Na eerdere afwijzing is de provincie Limburg alsnog één van de zes modelregio's geworden.
Diensteninnovatie gaat om het toevoegen van nieuwe diensten aan producten van de maakindustrie om te komen tot een hogere toegevoegde waarde en nieuwe verdienmodellen. ESIC gaat vooral haar deskundigheid gebruiken om de regio door te lichten en een rapport op te stellen. Dit rapport wordt in het voorjaar van 2014 verwacht. Advies en aanbevelingen uit het rapport worden dan bestudeerd of deze omgezet kunnen worden naar een concrete aanpak.

EMR
Aanloop 2e GCS tender was lastig en het was niet de verwachting dat de goedkeuring zo eenvoudig zou verlopen.
Voorbereiding voor een nieuw EMR programma verloopt moeizaam. Er is geen focus op een thema zoals economie & innovatie maar een diffuse blik op alles omdat een aantal partners de maximale vrijheidsgraden willen behouden in relatie tot hun eigen agenda. Ook het uitbreiden van het gebied met Leuven of Zuidoost Noord-Brabant kan op weinig steun rekenen. Dat geldt overigens ook voor gebiedsuitbreiding voor programma Vlaanderen-Nederland.
Ministerie van EZ heeft laten doorschemeren niet meer Managementautoriteit te willen zijn als er niets verandert. Wallonië staat te wachten om dit over te nemen.

LED structuur
Triple helix model voor Zuid-Limburg. Bestaat nu 1,5 jaar en is voortgekomen uit de wens van grote gemeenten om meer samen te werken op de gebieden van wonen, zorg, onderwijs en economie
Organisatorische structuur (zie **server**):
Bestuur: neemt beslissingen
Kernteam: vooral als "smeerteam" bedoeld om de samenwerking zo soepel mogelijk te laten verlopen en plooien glad te strijken.
Programma commissies: eerste beoordelingsronde van projecten om deze voor te leggen aan het bestuur

Het budget van LED komt uit gemeentegelden; € 6 per inwoners waarvan € 1,5 is gereserveerd voor branding. Via tenders wordt het overige geld weggezet, projecten kunnen worden ingediend om hier geld uit te ontvangen maximaal 100K per project. De provincie draagt financieel niet bij in de LED-structuur maar zit wel in het bestuur; daarnaast zal de provincie voor haar interessante projecten wel financieel ondersteunen.
LED opereert zeer proactief met name in de communicatie en bestempelt (en claimt hiermee) projecten als haar initiatieven waarmee soms in onvoldoende mate recht wordt gedaan aan de inbreng van de andere partners. Projectindieners zijn aan de andere kant wel te spreken over de snelle wijze van handelen. Gedeputeerde Beurskens is niet te spreken over LED. Hij zit dan wel in het bestuur maar verder hij is afzijdig en participeert niet actief mee in de promotie van LED.
Vanuit LED is de vraag gesteld richting Jean Severijns na te gaan welke de samenwerkings-mogelijkheden zijn met de regio Aken. Jean probeert invulling op deze brede vraag te geven door naar concrete samenwerking te zoeken tussen onder meer RWTH en UM. Op dit moment speelt in de regio Aken ook de discussie over de aanpak van de transitie van de bruinkool gerelateerde activiteiten richting een moderne kenniseconomie

Relatie LED – Brainport2020
Brainport 2020 is de uitbreiding van de Eindhovenregio met andere regio's van Oostelijk Brabant (5* regio en Midpoint) en van Limburg (GPV, Keyport en LED).

4. Sluiting
Bas sluit de vergadering; doet de mededeling dat donderdag overleg is tussen de team coördinatoren en het MT. Bas zal de voortgang van team 2 inbrengen en deze relateren aan de ontwikkeling van de andere teams en het cluster.

APPENDIX II

Datum: 12-12-2013
Tijd: 09:00-10:00
Locatie: Limburgzaal
Aanwezig: Erik Ritzen, Jan Maatjens, Edwin Bakker, Jean Severijns, Janneke Meulenbeld, Marga Poulssen, Bas Peusens, Angélique Hendriks, Jorn Joosten
Afwezig: Huib Daniëls, Winnie Peeters, Cees de Jong
Voorzitter: Bas Peusens
Notulist: Jorn Joosten

Agenda
1. Opening
2. Behandeling notulen vorig overleg
3. informerende lijst
4. Sluiting

1. Opening

Bas Peusens opent de vergadering; geen bijzonderheden

2. Behandeling notulen vorig overleg

Geen behandeling

3. Informerende lijst

Er waren vragen over het kennis-as programma.
De ambitie van de universiteit Maastricht was in het begin niet gericht op de regio, dit zal hopelijk met het kennis-as programma veranderen, dit is ook de wens van de provincie. Het programma zal aansluiting zoeken bij het topsectoren beleid van de provincie en nationale overheid.

De kennis-as is een programma van en door de kennisinstelingen, de provincie zal geen trekkende rol gaan spelen en alleen ondersteunen indien projecten langskomen die de provincie graag tot uiting ziet komen.

4. Sluiting

Bas sluit de vergadering; geen bijzonderheden

APPENDIX III

Notulen kennissessie team 2 Chemelot 22-03-2014

Er wordt geexperimeteerd met nieuwe governance structuren omdat de provincie zeggenschaoover de investeringen wil behouden. Maar de provincie kan niet dagelijks zich met InSciTe bezig houden.

De powerpoint slides laten de verschillende nieuwe scenario's zien.

De provincie wil een directe relatie naar de verschillende projecten. Dit wil het zodat het ook andere manieren heeft om imkomen te genereren. Een optie zou zijn om haar aandelen in de toekomst te verkopen. Dit is voor de provincie en de buitenwacht astig angezien ditde eerste keer is. De buitenwacht wil graag dat de province subsidieert maar de provincie wil dit liever niet. Ditmoet gezien worden als een leermoment. Dit kn ook toeeast worden op het kennis as programma,

De bestuurders bemoeien zich niet veel met dit proces, de ambtenaren moeten uitzoeken wat de best manier is. De provinciale staten willen zoveel mogelijk via aandelen maar wensen en bedenkingen worden nog aangeleverd. Tot nu toe is hier weinig beweging in te zien.

APPENDIX IV

Datum: 13-12-2013
Tijd: 09:30 - 12:45
Locatie: Veldekezaal

Agenda
1. Opening
2. 7 structuurversterkende projecten
3. Sluiting

1. Opening

De vergadering wordt geopend; geen bijzonderheden

2. 7 structuurversterkende projecten

Een toetsingskader voorafgaand het project moet er komen zodat duidelijk is waarop het project getoets gaat worden. Eenvoud aan de voorkant en niet moeilijkheid aan de achterkant

InSciTe & pilot plant faciliteiten
Er wordt positief op gereageerd en de noodzaak van de projecten worden erkend maar

VVD: investeringen zullen niet financieel rendabel zijn, ze hebben wel een maatschappelijk rendament
CDA: de provincie moet zakelijker zijn in haar investeringen, hetelfde geld voor het Chemelot Materialen Centrum
PVV: deelt de provincie mee in de vermarkting van de kennis? Hoe worden er inkomsten gegenereerd en financiele risico's afgedekt

Bosman: skeptisch over de grote investeringsrol van de provincie, het is wel heel veel financieel risico wat gelopen wordt maar bij noodzakelijkheid dan zij het zo. Vooral bij de pilot plant heeft hij er heel veel moeite mee.
D66: zo min mogelijk subsidieren: de campus is voorgetrokken en er zijn geen alternatieven bekeken.
Groenlinks: de projecten passen niet binnen de voorgestelde kaders

3. Sluiting

Geen bijzonderheden

APPENDIX V

Interview guide Master thesis
Subject:
Date:
Place:
Interviewer:
Respondent:

Opening
Thank the Respondent for his/ her time
Short summary interview process:
1 Subject – purpose interview
2 Recording interview
3 Questions from respondent's side
4 Possibility to stop interview when uncomfortable

Interview

Waarom is het consortium chemelot B.V. ontstaan?

Wat is de taak van het consortium chemelot B.V.?

Consortium chemelot B.V. als makelaar, wat houdt dit in?

Hoe is de onderlinge samenwerking tussen prv-dsm-um?

Waarom is er voor deze vorm gekozen?

Nu een aantal taken zijn overgenomen door het Consortium chemelot B.V., waar heeft de aandacht van de provincie zich naar verschoven?

In het Masterplan chemelot wordt de rol van de provincie beschrijven als: investeren in kennis/faciliteiten, is dit puur financieel?
Hoe wordt dit vertaald naar concrete projecten?

Is het duidelijk wat de rol van de provincie is binnen het proces van kennis binnenhalen? Is deze rol altijd hetzelfde of afhankelijk van de situatie?

Hoe wordt de 10-jaars doelstelling concreet vertaald?

Is er een beleidslijn die gevolgd wordt?

Hoe zorg je dat je niet van de ingezette lijn afwijkt?

Wat als de ingezette koers niet de resultaten oplevert die voorheen verwacht werden?

Op welke manier(en) is de provincie Limburg (actief) betrokken bij het proces om kennisinstituten aan chemelot campus te binden?
Doorvragen voor studenten/kenniswerkers

Is de rol beleidsmatig vastgelegd of wordt op project basis de rollen opnieuw gedefinieerd?
Waar ligt de focus met het binnenhalen van kennis, is dit het binnenland, buitenland, regio of anders?

Worden relaties met andere campussen/kennisinstituten beleidsmatig gefaciliteerd of is dit de taak van bedrijven/aanwezige kennisinstituten?

Kennisvalorisatie wordt vaak aangedragen als een speerpunt, wordt er concreets iets gedaan om de valorisatie van kennis te optimaliseren?
Welke rol heeft de provincie hierin?
Zijn rollen provincie –onderwijs -bedrijven beleidsmatig vastgelegd/formeel gedefinieerd?
Waarom wel/niet?

Vooral de aansluiting van het MKB op kennisinstituten/netwerken wordt vaak als problematisch aangeduid, wordt er speciale aandacht aan dit punt besteed?

Welke initiatieven zijn op dit moment/ zitten in de pijpleiding om dit punt aan te pakken?
Is het duidelijk waar de huidige situatie voor verbetering

Closing
Questions respondent
Possible follow up interview if necessary
Thanking respondent

APPENDIX VI

The following persons were interviewed:

- H. Daniels (2X), government of Limburg -department of economics and innovation-, 8 January 2014
- F. van Lissum, government of Limburg – program manager-, 14 January 2014
- E. Bakker, Chemelot B.V. – public affairs-, 16 January 2014
- H. Daniels, government of Limburg -department of economics and innovation-, 17 January 2014
- R. Joosten, former employee, government of Limburg -department of economics and innovation, 27 February 2014
- H. Delissen, Chemelot B.V – business development-, 19 March 2014
- M. Lambriex, Chemelot B.V. – Liaison office-, 1 April 2014
- F. Schaap, Chemelot B.V. – Business development-, 4 April 2014